

THE HOPI INDIAN COLLECTION IN THE UNITED STATES NATIONAL MUSEUM.

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INTRODUCTION.

This publication aims to give an impression of the arts and industries of a tribe of Pueblo Indians at a period when they were little modified by outside influences. It may serve as a guide to the Hopi collection now exhibited in the Natural History building of the United States National Museum. Handbooks of this character which are made up virtually of extended labels of the collections are projected for other sections of the exhibit of Ethnology.

The following descriptive label for the family group case displayed in the west north hall of the Natural History Museum of the Smithsonian Institution in Washington gives a brief account of the Hopi:

The Hopi Indians occupy stone-built villages in northeastern Arizona. They were first seen by white men in 1540 when Tobar and Padilla were dispatched by Coronado to visit them. On account of the isolation of their country, they have preserved to a greater degree than other tribes the arts and customs of the Pueblos. They are farmers and depend mainly upon corn for their subsistence. Among the arts in which they are skillful, are weaving, basket-making, and wood-carving, and in the minor art of cookery they are widely known among the Indians. The group represents the parching, grinding, and baking of maize which goes on in every household. A woman and little girl grind on the slanting millstones the corn prepared by the parcher. The baker spreads with her hand the batter on the heated stone slab and the result is the paperlike bread called piki. Another woman is weaving a basket of yucca leaves. The man brings in from the field a backload of corn ears and the boy exhibits triumphantly a rabbit which he has killed with the curved boomerang club peculiar to the Hopi.

AGRICULTURE AND REARING.

Agriculture is the principal occupation of the Hopi. They are industrious and resourceful tillers of the soil under conditions which would seem hopeless to a farmer. Their efforts are principally devoted to raising corn, but wheat, beans, squashes, and common vegetables are grown. They preserve an agriculture of native cotton, *Gossypium hopi*, which they use for ceremonial purposes.¹

¹ Lewton, F. L., The Cotton of the Hopi Indians: a new species of *Gossypium*, Smithsonian Misc. Coll., vol. 60, No. 6, Oct. 23, 1912.

Corn is planted in the sandy soil along the washes, dependence for its ripening being placed on the winter snows and the summer thunderstorms. In spite of the conditions, large quantities of corn are produced. The fields are cleared of brush in February and leveled. Planting begins in April and the crop is gathered in September. Spring frosts and sandstorms are drawbacks to the success of the crops, and sometimes floods injure the low-lying fields. The tools used are a planting stick usually with wedge point (pl. 19, fig. 4), but sometimes having a blade (pl. 19, fig. 5). A hole is dug and from 6 to 12 or more grains placed therein and covered. The hills are about 6 feet apart. The plant is small and rarely 5 feet high, the ears shooting near the ground.

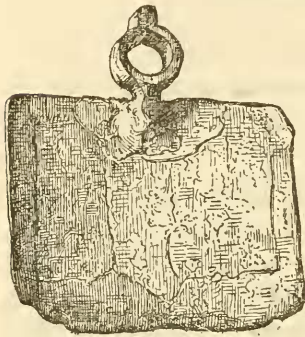


FIG. 1.—IRON BROAD HOE OF SPANISH PATTERN.

The field is kept clear of weeds by means of hoes, usually the heavy homemade blade of Spanish pattern, like those seen among the Rio Grande Pueblos (fig. 1), sometimes of wood (pl. 19, fig. 6), and anciently, according to tradition, of stone. These implements

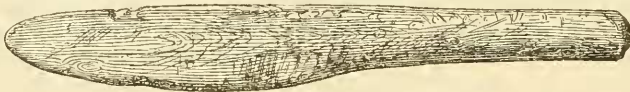


FIG. 2.—HAND DIBBLE OF WOOD.

are smooth spatulate blades of fine stone (see Archeology, second floor, east side), found mostly in the northern cliff-house region, but never in ancient Hopi sites. The Hopi call them *wiki*, hoes, regard them as sacred objects, and place them on the altars of some of their ceremonies, but there is little evidence that the fine spatulate stones were actual hoes, though the Hopi may have anciently used stone hoes. The wooden hand trowel for tending plants appears to be a survival (fig. 2).

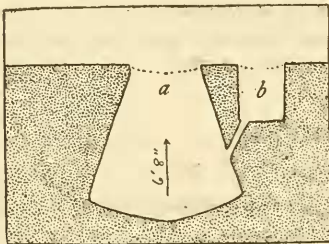


FIG. 3.—FIELD PIT OVEN FOR ROASTING GREEN CORN; a, FIRE PIT; b, FLUE.

Corn is gathered by removing the ears and transporting them to the pueblo in wicker carrying baskets on the back (see family group) or in blankets over the back or on the burro. The fodder is gathered by breaking off the stalks and tying them in bundles. It is usually almost valueless, as the leaves are frayed or whipped off by the wind. Much of it is used in the green state during the roasting-ear season, when a part of the crop is baked

in field pit ovens (fig. 3), and either eaten at feasts or strung on cord to be dried for winter provision. Husking pegs of bone or wood have been observed among the Hopi, but it is not known that this implement is ancient. Corn ears are stored in the house in a place reserved for the purpose, is often sorted by the colors, and is occasionally taken out, sunned, and brushed to free it from dust and insects (pl. 20). It is also stored by crops, one year's being held over in case of failure due to a bad season. This custom is said to have arisen on account of famines, which have often plagued the Hopi in former years. Hopi corn is a pure breed of ancient strain, 12 rowed, white, yellow, red, carmine, dark blue, black, and variegated. The cobs are slender, the ears 5-7 inches long, generally perfect, and the grains regular and not indented (pl. 21).

The Hopi have also pop corn and sweet or sugar corn, both probably introduced. Sweet corn is referred to as the particular possession of the Middle Mesa Pueblo Shemopavi, where it is raised in some amount.¹

In the cornfields scarecrows consisting of sheep scapulae, tin cans, etc. (pl. 22, fig. 3), are set up.

For cleaning brush from the fields, a curious rake-fork is used (pl. 19, fig. 1, Cat. No. 128767, collected by Mrs. M. C. Stevenson). It consists of a three-tined branch of a juniper tree, peeled, and across the tines is secured by lashing a strengthening rod of wood.

For picking the fruit of the prickly pear, wooden tweezers, *natcha*, are used (pl. 19, figs. 2, 3). The fruit is picked with the tweezers and rolled in sand until the spines are removed. The Navaho, Zuñi, Pima, Papago, and other southwestern tribes use similar implements.

A great number of varieties of beans are grown by the Hopi and these form a substantial addition to their fare. They are named *pala mozhri*, red beans, *avatch mozhri*, speckled beans, etc., from their color or markings. Success also sometimes attends the planting of peas. Squashes, gourds, pumpkins, melons, and onions are raised. As in Mexico, the flowers of the squash are much appreciated as a dainty food.

Of cultivated fruits, the Hopi have only peaches which were introduced among the Pueblos several centuries ago by the Spaniards. The trees are planted on sand slopes below the pueblos and as there are no peach diseases or insect enemies in the region, they flourish to a considerable age. At this elevation, however (6,500 feet), frosts render the crop precarious. The Hopi are extravagantly fond of the fruit and a good yield is a matter of great rejoicing. The berries of the rhus and prickly pears furnish the only native fruits in the immediate environment of the Hopi.

¹ Collins, G. N., A drought-resisting adaptation in seedlings of Hopi maize, Journ. Agricultural research, Washington, D. C., vol. 1, No. 4, Jan. 10, 1914.

DOMESTICATION.

At the time of the arrival of the Spaniards the Hopi had two domestic animals, the dog and the turkey. The dog appears to have been a short-legged species,¹ resembling a dachshund. The name given this animal is *poko*, which also means pet or attendant animal of the world quarter beings. Bones of the dog are not infrequently dug up. The skull of a dog was excavated from a grave at Chavez Pass, Arizona,² the specimen being polished, as though from use as a fetish or object of special care.

The turkey is the only bird that was domesticated by the American Indians north of Mexico. In the latter country the turkey was a familiar domestic animal, and in the Pueblo region the same condition of affairs seems to have prevailed since early times. The turkey is mentioned in the Zuñi cosmogenic legend, and its tail-feather markings are said to be caused by the slime of the earlier wet world. It is a sacred bird, probably never eaten but preserved for its feathers, which were used both for ceremonial and practical purposes in *pahos* and in preparing the feather cord from which garments were constructed.³

The Hopi have received from the white man horses, burros, cattle, sheep, goats, pigs, chickens, and cats. It is difficult to say in what order the animals came into the possession of the Hopi, but in point of usefulness the smaller animals are first. (A bell of horns for grazing animals is shown in pl. 22, fig. 1.) The care of cattle necessitates the use of the horse, and it is probable that the Hopi acquired these animals late and never owned them in number. The burro, however, is an animal suited to meager environments, and has become inseparable from the Hopi economy. With the larger animals came rude harness, spurs, whip, hobbles, the lariat, and other articles connected with them (pl. 22, fig. 4).

In the humane treatment of animals the Hopi has much to learn. Horses are often overworked and starved, and the goad is sometimes cruelly used on the weak, jaded animals. Burros are "punished" for stealing, the penalty being the loss of an ear. Some old offenders have suffered the loss of both ears. The Hopi does not appear to be intentionally cruel; he is rather childishly careless of the rights of the dumb creatures under his charge. The equipments rendered necessary by the introduction of the horse are crude compared with those of the Navaho, and reflect the scanty resources of the Hopi and their incomplete utilization of the horse, again losing

¹ Lucas, F. A., A dog of the ancient Pueblos, Science, n. s., vol. 5, No. 118, April 2, 1897, p. 543-544.

² Fewkes, J. W., Two summers' work in Pueblo ruins, 22d Ann. Rept. Bur. Amer. Ethn., p. 27.

³ Hough, Bull. 87, U. S. Nat. Mus., 1914, p. 71.

in comparison with the Navaho, who are the best horsemen in the Southwest.

The Hopi depend almost entirely upon their flocks of sheep and goats for the material for clothing and for animal food. The sheep apparently do not differ from those of the Navaho, whose flocks are mostly mongrel interbred animals whose fleece is coarse and full of chaffy useless fibers called kemp by wool graders. The fiber is very strong and serves well for the manufacture of coarse stuffs. Hopi sheep are herded with goats whose courage and aggressiveness serve to protect the weaker sheep. The flocks are constantly tended by herders while grazing. At nightfall they are driven into stone corrals, located on the wide ledges just below the pueblo. The herders are usually women and children, but the men also are charged with the responsibility when the numerous ceremonials do not require their attention. A crook is used in herding and the sheep are sheared with the iron shears of commerce. Sundry piles of stone set up in various places are said to be for the purpose of guiding the herders in driving their charges, probably with regard to the boundaries of communal or clan lands.

Chickens are kept in some number for eggs, which are sold to the white people when the latter can be induced to buy. Sometimes a coop is built on the house roof for the chickens, but usually they roost in the rooms. They do not thrive, principally on account of insect pests.

Dogs are plentiful in the Hopi villages, where they lie around sleeping in the shade all day. Their nocturnal habits appear in the excursions, yelping and fighting, in which they engage after sundown in the pueblos. They are mongrels of little use except as scavengers and for hunting rabbits. Cats are very scarce and die soon under the severe conditions as to food and water in the pueblos.

DOMESTIC ECONOMY.

The Pueblos are better provided with vessels for various domestic use than any other tribes, and this accords with their great advancement in domestic science. With apparently small advantages to be derived from an environment that seems to offer little for material needs, the Hopi present a striking example of resourcefulness. The chief necessity in this arid region is for containers adapted for water, salt, seeds, for cooking purposes, and other multifarious uses; and this need was supplied by pottery, which even at the earliest time at which the Hopi are known to investigators was greatly diversified in form, texture, and ornamentation. Plate 23 shows: Figure 1, a dipper; figure 2, a salt vessel; figure 3, a condiment bowl; figures 4 and 8, bottle forms for water; figure 6, spoon; figure 5, a water vase; and figure 7, a food bowl.

Vessels of wood.—Vessels of wood were uncommon and were usually procured only when natural shells or knots suggested the use as spoons or small bowls. The cottonwood, which may be termed the culture tree of the Hopi, decayed easily, forming hollow cylinders which were adapted with not much work to the shells of drums and gave this tribe their only idea of a boat, expressed in the snake legend. The roots of this tree being of even grain, soft and easily worked, were the favorite material for feather boxes and gaming cups. (See pls. 43, 48.) Feather boxes for holding the plumage necessary for *pahos* and the decoration of religious paraphernalia are by far the most common wooden vessels employed by these Indians. (See pl. 43, figs. 2, 3, 4; and fig. 4.)

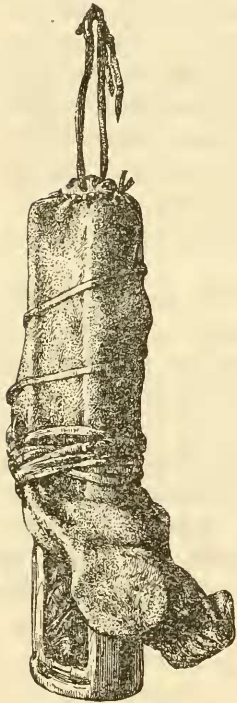


FIG. 4.—BOX WITH BUCK SKIN COVER FOR SACRED FEATHERS.

Vessels of skin, etc.—Vessels of skin, rawhide, or membrane were also of slight value in the Hopi domestic economy, and those now or recently found in the villages were of scrota of the domestic goat, made by distending the membrane with sand, leaving to dry, and fitting with a rim of bent branch of rhus over which the skin was turned and stitched with sinew. The Hopi, however, knew how to work rawhide into masks, decoys, etc.

Gourds.—The light, strong rind of the cultivated gourd marked this plant for a wide range of usefulness among the Hopi. Despite the discovery of pottery with its attendant economies, the gourd continued in favor, its lightness and strength being valuable qualities, while its use was not superseded by basketry, which brought in vessels that were lighter than pottery and nonbreakable.

The species of gourd cultivated by the Hopi are small, and the imposing gourd vessels such as are seen about the Pima houses are absent from the Hopi economics. The small gourds, however, are very useful for many purposes, and the shell, which is more available and more easily worked than wood, has numerous applications. In connection with water the gourd is used for dippers (pl. 24, fig. 3, pl. 22, fig. 2) spring bailers, sacred water vessels (pl. 24, fig. 2) and canteens; for household use, as spoons, cups, and dippers; as tools, for pottery smoothers, and cups for paint; for special use, as seed bottles and vessels (pl. 24, figs. 1, 4, 5), medicine holders, powder horns, etc.; in music, as horns, trumpets, flutes, bells, and rattles; in games, as pea shooters, etc.; in religious paraphernalia, as parts of masks such as

noses, horns, flowers, etc., the mask head of the serpent effigy, also for containing sacred honey and water, and as *pahos*; in art, as gourds decorated with symbolic designs. The gourd has always been fertile in suggestion to the Hopi and to the tribes of man, as illustrated by the adaptations for masks mentioned above and for the forms it has impressed upon pottery and basketry.

Cradles.—The Hopi cradle is of two types, the one commonly used consisting of a yoke made by bending a sapling of green wood and weaving across it wicker work of rhus stems (pl. 25, fig. 2). A bow also of wicker is adjusted at the upper end of the cradle to protect the face of the infant. A carrying cord is attached to the limbs of the yoke about one-third of the length of the cradle below the head. An orifice is left in the wicker work of the cradle at the proper place for adjusting an absorbent mass of frayed cedar bark under the infant. The baby is folded in a blanket, laid on the cradle and secured to it by means of a woven belt or band of cloth wound continuously around the cradle and infant. The cradle described above is peculiar to the East Mesa and Oraibi. The other type of cradle consists of a thin board with rounded ends and has a collapsible bow made of three withes held in position by cords (pl. 25, fig. 1). The margin of the plank has holes burnt or bored through it in which cord loops are fastened. The band for securing the infant on the cradle is rove through these loops. This type of cradle is peculiar to the Middle Mesa. It is more difficult to make than the wicker cradle, since the working out of a board by primitive methods presents an almost insuperable obstacle. In recent years boards from packing boxes have been utilized for cradles. The old cradles have been preserved for generations and are worn thin and smooth from long use. Especially is the wear noticeable where the head of the infant comes in contact with the board. The cradle of the Hopi appears to be a survival from a former environment which entailed the use of a pack cradle whose necessity is apparent among tribes not having fixed habitations. The Hopi now use the cradle merely as a bed for the infant during its period of sleep, the secondary explanation being that lashing in the confines of the cradle will make the child grow straight, and with this object in view especial attention is given to a boy. The effect of the hard cradle in producing deformation of the skull has been noticeable and the flattened back of the cranium of the Hopi and most other Pueblos is very characteristic. This deformation is observed in the most ancient crania recovered from the graves in this region.

Fire-making tools.—Like many other tribes of the world, the Hopi have preserved their primitive wood friction fire-making implements for the purpose of religion. The abandonment of the fire sticks in practical use, however, is recent, and all Hopi men still know the

method. The apparatus consists of a spindle and the tablet of wood upon which it is rotated, kindling of rubbed cedar bark and a roll of cedar bark used as a slow match (pl. 26, figs. 1-3). The drill and hearth are made of the root of the cottonwood, a material of peculiar excellence for the purpose. In the New Fire Ceremony the lower piece or hearth employed is made of sandstone, a custom unique in the history of fire-making.

COSTUME AND ADORNMENT.

Man's costume.—There is evidence that formerly when skins were more plentiful the Hopi men sometimes wore shirt coats of tanned

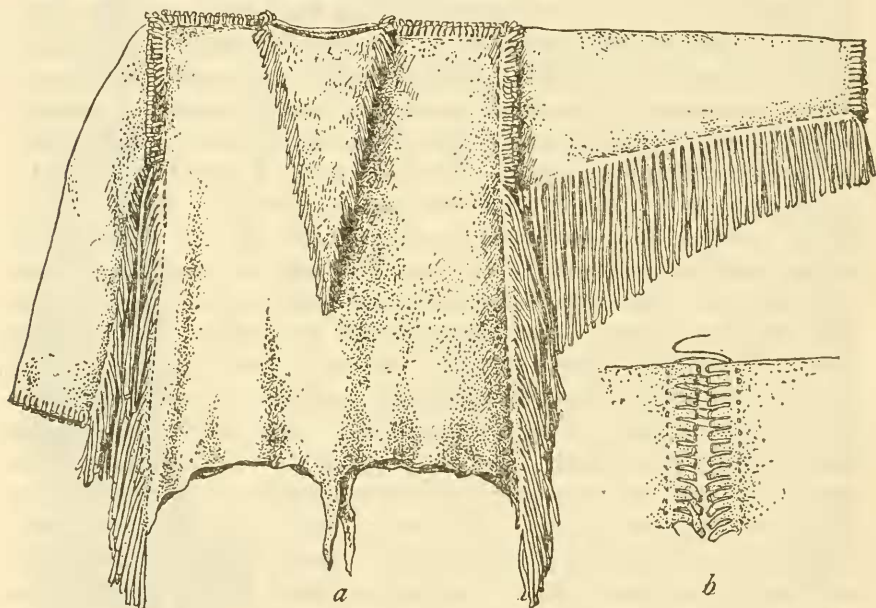


FIG. 5.—*a*, BUCKSKIN SHIRT OF ARCHAIC STYLE. *b*, DETAIL OF SEAMS.

deerskin of the general type prevailing in America (fig. 5). This is true also of the Zuñi and Rio Grande Pueblos and some specimens of this costume, which seems to have come in from the Plains, have survived. As a rule, however, the costume of the Pueblos is affiliated with that of Mexico and is thus characterized by the use of weaving to a greater extent than among any other North American tribes. Men formerly wore leggins of tanned skin, but these were also probably adopted from outside sources. The typical body garment of the Hopi man in historic times was a length of dark blue or black woolen cloth with an opening made in the middle for drawing over the head, equal lengths of the garment hanging over the back and front like

the Mexican poncho (fig. 6). This early form with the addition of sleeves was sewed partly down either side, leaving openings under the armpits and slits in the skirts (fig. 7). The sleeves were loose and short. This shirt-coat, which is shown complete in figure 8, had little ornament, but modern bits of ribbon and stitchings of red and green worsted have been affected. No undergarment except a loin cloth was worn (fig. 9). This feature of dress is well nigh universal and may be considered among the most primitive. The ceremonial costume gives a good indication of the archaic dress. This consists of a width of cloth finished on the edges, wrapped sarong fashion around the waist and held by a belt (fig. 10). The leather belt was probably not worn in ancient times and not generally in modern times, those found among the Hopi being adopted from the Navaho. These costly leather belts, heavily adorned with large pierced and chased silver plaques, are worn by young men who wish to be leaders of fashion. Woven belts and garters for holding the leggings are ancient (fig. 11).

It is difficult to ascertain whether the legging was anciently used. The presumption, however, is that it came into use at the time when the moccasin replaced the sandal. The legging was a square of tanned deerskin folded once around the calf of the leg and tied with a thong or woven garter (fig. 12 *a-b*). A more ornamental legging with pairs of tying cords and fringe (fig. 13) is a companion piece with the "old style" shirt (fig. 5). Another more pronounced in art, folded on the leg and tied with the garter, is shown in figure 14. Knit leggings are sometimes worn by old men and women.

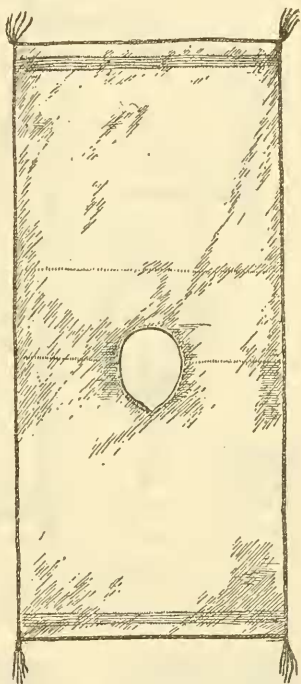


FIG. 6—ARCHAIC FORM OF SHIRT OF WOVEN STUFF.

Moccasins are worn by all Hopi men. Though their form is characteristic and not to be confounded with those made by any other tribe, it is a fact borne out by archaeological evidence that the Hopi and other Pueblo tribes anciently were sandal-wearing peoples and it must be concluded that the leather moccasin was acquired from the non-Pueblo tribes. Peculiarities in the manufacture of the Hopi moccasin, especially the sole bent up around the sides of the foot, seem to point to the Navaho and Apache as the tribes responsible for the change in footwear, and this change probably took place after

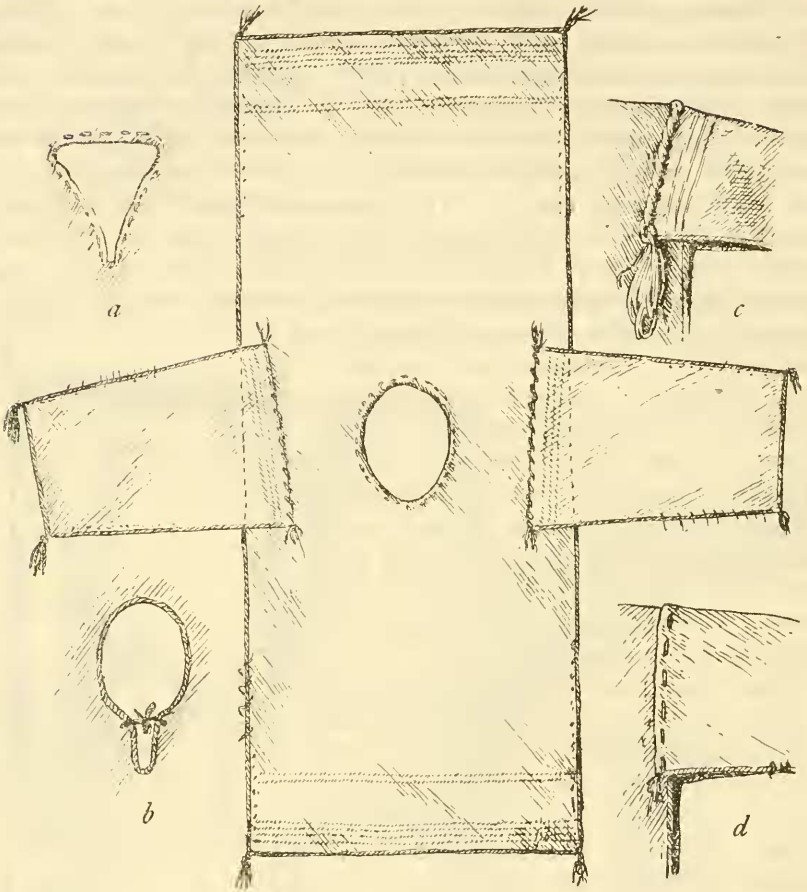


FIG. 7.—SHIRT FORMED BY ADDITION OF SLEEVES. *a, b*, FORMS OF NECK OPENINGS. *c, d*, METHOD OF APPLYING SLEEVE.

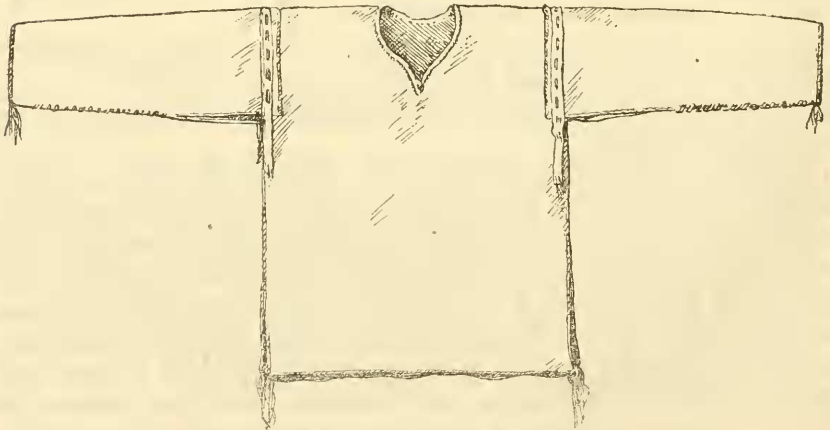


FIG. 8.—COMPLETED SHIRT.

the introduction of cattle. The man's moccasin (fig. 15) is well made and serviceable. It is composed of (*a*) the sole made of rawhide from the back of the cowskin, (*b*) the vamp, and (*c*) the tongue. At present the Hopi use silver buttons for fastening the flap, like the Navaho, instead of tying thongs. The boys' moccasin (fig. 16) sometimes has an extended vamp in two parts sewed together, going around the foot as an anklet.

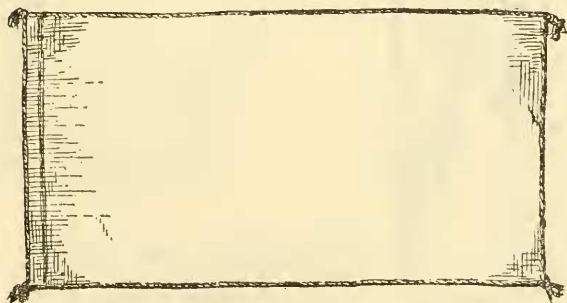
The blanket also enters somewhat into Hopi costume as an emergency or temporary wrap for a naked priest going through the wintry air to the Kiva, or by the softer men of modern days. The blanket is generally put to more practical use for carrying a canteen or supplies on the back or as bedding.

Smaller adjuncts of clothing, as pouches, etc., were rarely used by the Hopi, except in ceremonies for sacred meal (see fig. 46).

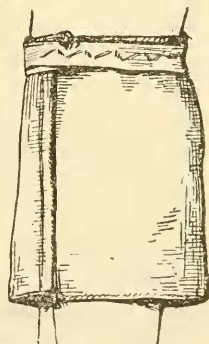
Among the Hopi men, not so frequently as among the other Pueblos, the hair is tied in a knot at the back of the head with a narrow woven tape. The Hopi have adopted this style exclusively since the "hair-cutting order" went into effect. Anciently the hair cord was probably of twisted or braided cotton or other fiber like the Navaho *tsos be tlotl* early adopted by this tribe from the Pueblos. Garters for securing the tops of the leggings are worn by Hopi men and this custom is common among all the Pueblos, but there is no evidence of its antiquity. Ornaments worn by men consist of beads of worked shell and stone made into a necklace. The beads, which are disks, are strung uniformly into a strand of a certain length or are spaced



FIG. 9.—MAN'S LOINCLOTH.



a



b

FIG. 10.—*a*. MAN'S CEREMONIAL KILT. *b*, METHOD OF WEARING.

at intervals with oval pieces of shell or turquoise (pl. 27, fig. 1). Several of these strands are bunched and bound together for a short

space, forming a necklace which is put on over the head. The importance and value of these necklaces to the Hopi is very great, because of the religious significance of the beads and their pecuniary worth. The standard value is about two dollars a string, depending on the character of the beads and the amount of turquoise. The Hopi do not make beads, but obtain them in trade from the Zuñi or Rio Grande tribes. Beads are the most ancient recognizable feature of Pueblo costume and are found practically of the same form and materials in prehistoric ruins. Ornaments of metal, as earrings, finger rings, etc., are of modern introduction among the Hopi, who were unacquainted with metallic minerals before the arrival of the Spanish. Hopi men formerly wore on the left wrist a band of leather to take the rebound of the bowstring, but this part of costume has not survived for personal use, though it is still in ceremonial use.



FIG. 11.—WOVEN GARTER.

The parts of man's costume here described may be regarded as typical of a completely dressed Hopi, but only on rarest occasions has any one seen the complete assemblage. Usually the season, avocation, wealth, age, or whim of the individual fixes the matter whether he shall wear all, a part, or

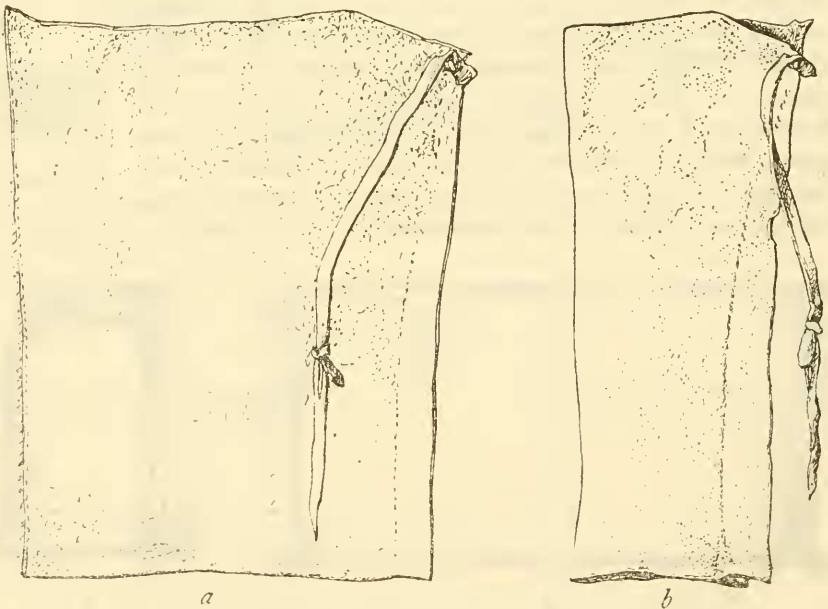


FIG. 12.—*a*, OUTLINE OF MAN'S LEGGING; *b*, LEGGING COMPLETE.

next to none of the tribal costume. As in civilization, the most lavishly dressed man has nothing else to do.

Married woman's costume.—The chief garment of the married woman is of dark brown and blue blanket stuff woven in one piece for her by the men weavers. It is wide enough to reach from the shoulder to the middle of the lower leg, though worn shorter when

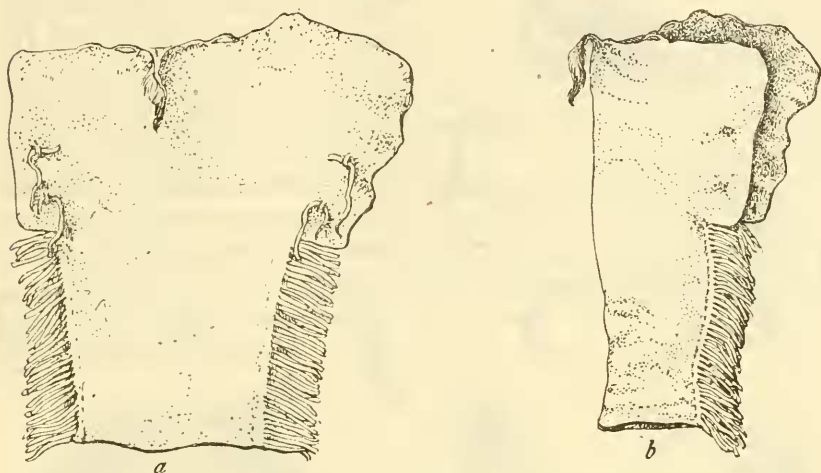
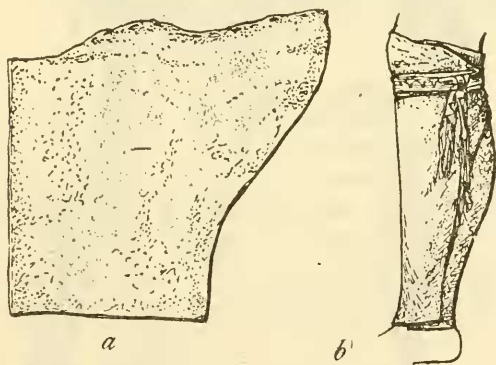


FIG. 13.—*a*, OUTLINE OF FRINGED LEGGING; *b*, LEGGING COMPLETE.

moccasins and wrap-leggins form a part of the costume. The making of one of these blankets into a dress is simplicity itself, only requiring the two ends to be brought together and sewed (fig. 17), the result being a bag open above and below, the seam on the left side. The upper edges are now stitched together for a short distance over



14.—*a*. OUTLINE OF WRAP-LEGGING; *b*. LEGGING APPLIED AND SECURED WITH GARTER.

the right shoulder, an opening being left there for the right arm. It is now ready to be drawn on over the head, and when it is in place it will be seen that the left arm and shoulder are free (fig. 18). The dress is sometimes ornamented with embroidery and stitching of colored yarns. The weaving of this dress is interesting and is described on page

254. Sometimes the blanket, *pusala*, is not made into a dress, but is used to enwrap the baby or for other household purposes. It is the completed fabric in demand among the Pueblos, with whom it was exchanged for beads and other commodities. The

pusala is of standard size, measures 50 by 60 inches, and as all Pueblo wear the same style of dress, it is available for clothing in any part of the Pueblo region.

The serviceable quality of the Hopi *pusala* is excellent and well known to the Pueblo Indians. A wide, long belt, woven by Hopi women or purchased from the Navaho, girds the dress at the waist (fig. 19). This belt is given many turns around the body, and the end tucked under,

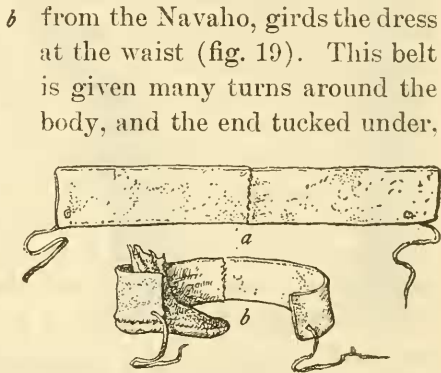
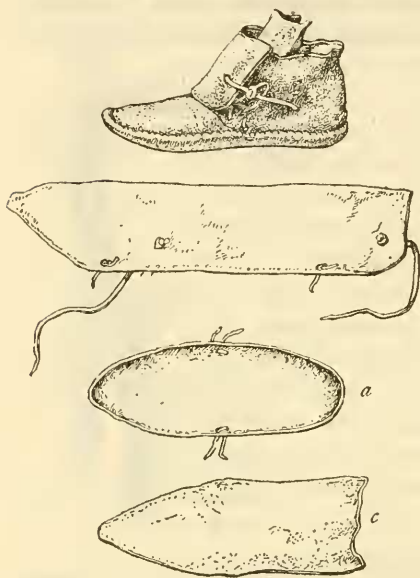


FIG. 15.—MAN'S MOCCASIN. *a*, SOLE; *b*, VAMP; *c*, TONGUE. FIG. 16.—*a*, BOYS' MOCCASIN WITH *b*, ANKLET VAMP.

the long fringe hanging down on the left side (see fig. 18).

Unmarried woman.—The costume of the unmarried woman is like

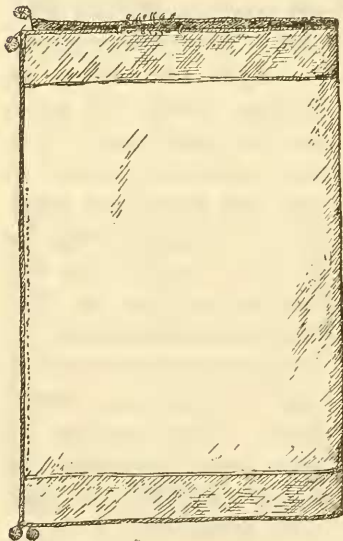


FIG. 17.—WOMAN'S BLANKET DRESS.



FIG. 18.—MODE OF WEARING WOMAN'S BLANKET DRESS.



FIG. 19.—WOMAN'S WOVEN BELT.

that of the married woman except that earrings consisting of little wooden tablets overlaid on one side with a mosaic of turquoise are

worn (pl. 27, fig. 2). The dressing of the hair in whorls is characteristic of the maidens. The method of hair dressing is as follows: The hair is carefully brushed with a bundle of grass stems (pl. 28, fig. 1), parted in the middle and divided into two locks, each wound over a wooden bow (pl. 28, figs. 2, 3) of size determined by the length of the hair. The mass of hair on the bow is pressed together at the middle and wound with hair cord (pl. 28, fig. 4), which is passed at each turn also around the lock of hair next the head in figure eight winding. When the winding is completed, the bow is removed and the hair adjusted into a circular shape. Previously the hair whorls were held in shape with a light structure of corn husk covered with hair combings. These forms were six inches in diameter divided into two sections (fig. 20, *a, b*) the division facilitating the tying of the hair (fig. 20 *c*). This coiffure is said to represent the squash flower and to be significant of fertility as well as to indicate that the girl is of marriageable age.

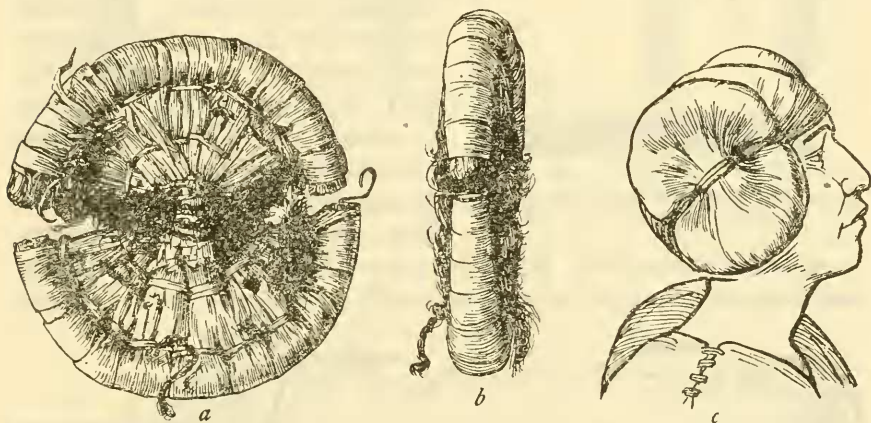


FIG. 20.—*a, b*. ARCHAIC HAIR FORMS OF CORN HUSK. *c*. MAIDEN'S HAIR WHORLS.

Children.—Little attention is given to the clothing of children, but such garments as they possess are modeled after those of their parents, being usually cut from cast-off apparel of adults.

Married women.—In full dress the Hopi women wear a camisa with sleeves. This garment is at present made of calico, resembles the Mexican *huipil*, but it is not possible to say that it is traceable from ancient times. The probability is that it was adopted not many years ago.

The shoulder blanket is the most striking article of Hopi women's dress. The colors are red, white, and blue, the body of the blanket being white with wide border of red and blue. The material is cotton and wool and the weaving is diversified and excellent. The blanket measures 36 by 48 inches and is worn over the shoulders somewhat like a shawl. It is not customarily found in ordinary

use, but is worn in full dress and in ceremonies (fig. 21*a, b, c*). Unmarried girls, however, wear it when out walking, and matrons don it on gala occasions or during ceremonies. Within the last 15 years Hopi women have begun to wear a length of gay cotton print in the manner of the Mexican rebosa or the Spanish mantilla. It is like these also, a versatile garment as to the methods of wearing it, and adds a bit of style to the rather primly clad and demure maidens and young matrons. The blanket worn as part of the marriage ceremony, and which becomes the woman's choicest possession, is woven of white cotton. It is carefully woven, so as to be a perfect example of the weaver's skill (fig. 22*a*). It measures 48 by 58 inches, is quite heavy, the weaving being like canvas, and requires the tying strings observed on the upper edge. The corners are sometimes reinforced with yellow yarn. It is rolled in a reed mat (fig. 22*b*). After the marriage ceremony the blanket is heavily embroidered with worsteds

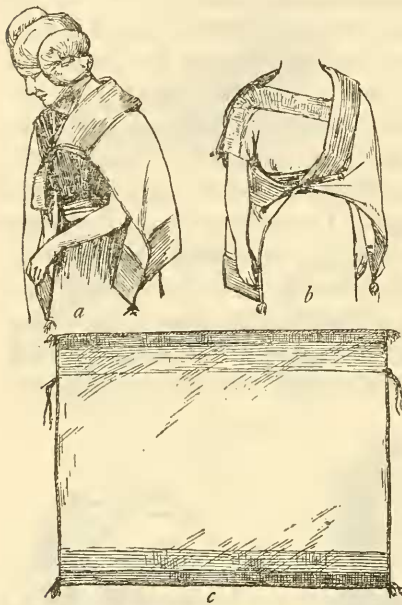


FIG. 21.—*a, b*, METHOD OF WEARING THE SHOULDER BLANKET. *c*, SHOULDER BLANKET.

forced with yellow yarn. It is rolled in a reed mat (fig. 22*b*). After the marriage ceremony the blanket is heavily embroidered with worsteds

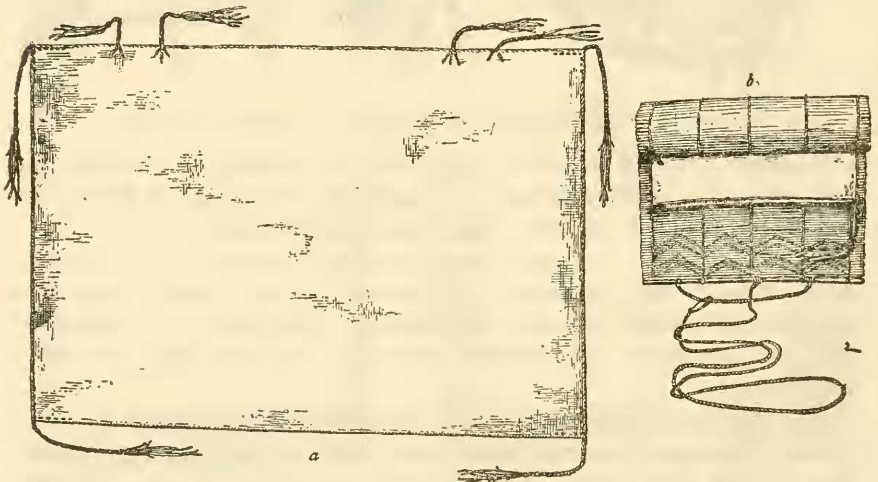


FIG. 22.—*a*. WHITE COTTON WEDDING BLANKET. *b*, WEDDING BLANKET ROLLED IN BED MAT.

in pleasing color and designs and heavy tassels are fastened to the corners. The Hopi married woman's hair is parted with a straight

part and gathered into two locks over the ears. Each lock is wound over the first finger and the end drawn through as the finger is withdrawn (fig. 23). The end of the lock is looped up and caught in the winding (fig. 24). There is thus found a loose knot which is wound over and over with hair cord, the result being a spindle swelling at



FIG. 23.—METHOD OF TIEING WOMAN'S HAIR, FIRST STAGE.



FIG. 24.—METHOD OF TIEING WOMAN'S HAIR, SECOND STAGE.



FIG. 25.—METHOD OF TIEING WOMAN'S HAIR, COMPLETE.

the middle of the lock (fig. 25). In connection with care of the hair a device of thin slips of hardwood is used for crushing lice (fig. 26). Navaho silver bracelets are sometimes worn and rarely earrings. Necklaces like those of the men are worn. Formerly necklaces of juniper berries and other wild fruits and seeds were worn by women (pl. 27, fig. 3).

Hopi women customarily go barefoot, but it is probable that the cumbrous moccasin with wrap-leggins was formerly more in use than at present, when deerskin is scarce and expensive, beyond the means of the poor and frugal Hopi. The woman's moccasin (fig. 27a, b, c, d, e) is small, stylish, and has the sole turned higher around the sides of the foot than the man's moccasin. To the edge of the upturned sole is sewed a whole white tanned deerskin, which is wrapped in folds around the calf of the leg and ties at the knee,

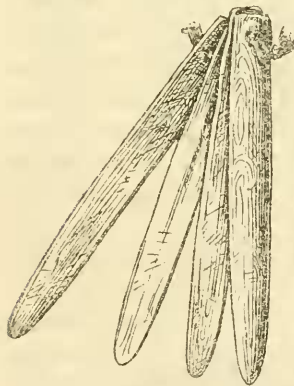


FIG. 26.—SLIPS OF HARDWOOD FOR RIDDING HAIR OF INSECTS.

giving the limbs a most elephantine appearance. Moccasins of this style are required in the trousseau of a bride, and it is probable that they will be made to last her lifetime, since she, like her sisters, will prefer to go barefoot. Baby's moccasins are made of fur (pl. 29, fig. 2) and small children wear a replica of their elder's moccasin (pl. 29, fig. 1, boy's moccasins; fig. 3, small girl's moccasin leggins).

A curious and rare article of costume is an eye shade, which is made of a circular frame of rods (fig. 28*b*) to fit around the head and a bowed frame attached, covered with skin to form a visor (fig. 28*a*).

WEAVING.

The summer climate of the elevated region inhabited by the Hopi is that of Maine, but the winter temperature, while not so low is

nevertheless cold enough to necessitate substantial woolen clothing. For centuries the Hopi have been famed as weavers of excellent blue cloth which was traded for by many tribes living far or near in the Pueblo region. The Hopi did not weave cloth in a commercial sense; the products of their looms were mostly finished "blankets" of established measurement (50 by 60 inches), which without cutting or alteration would make a woman's dress or smaller "blankets" for children (see *Costume*, p. 247). The true blanket or *serape*, like those for whose manufacture the Navaho are celebrated, was so rarely made by the Hopi that it can scarcely be considered in describing their textile industry. Narrower widths of woolen stuff than that of the woman's dress were made for men's garments. Special weavings of cotton, or of cotton and wool, as the wedding blanket and the girls' shoulder wrap, etc., were of ceremonial character and are treated under separate headings.

Materials.—The earliest fabric of the Hopi referred to by white

men was made of cotton and this textile material is found in the ancient sites of the Pueblo region. Cotton and shredded yucca fiber were the ancient vegetable fabric materials. The use of cotton has survived the introduction of wool, being prescribed for textiles used in ceremonials, the largest work being the wedding blanket (see also *Hair cord*, p. 261). Cotton was prepared by whipping the fiber-enveloped seeds with a bundle of pliant rods (fig. 29) on a bed of sand, the process being shown in figure 30. This primitive gin removes the seeds and leaves the cotton in a fluffy mass, which is

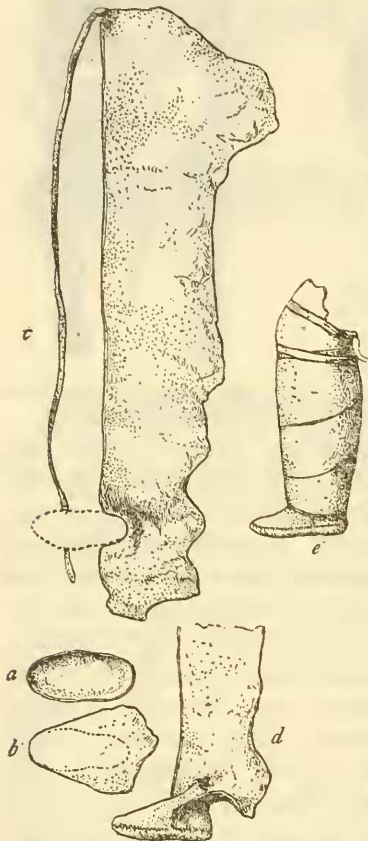


FIG. 27.—WOMAN'S MOCCASIN LEGGING.
a, SOLE; *b*, VAMP; *c*, WRAPPING; *d*, VAMP
 SOLE AND WRAPPING JOINED; *e*, COM-
 PLETE.

made into rolls by hand. Bowing cotton after the Asiatic method appears to have been unknown in America.

The excellent quality of the Hopi blanket is due to the strong fiber of the wool of their native sheep and to the conscientious

work in preparing the yarn. The washed wool is dyed with indigo, a material that has from time immemorial been an article of commerce in the Southwest, where it was introduced by the Spanish. The wool, which

was formerly whipped like cotton, is now carded with the toothed appliance which was no doubt introduced on the transfer of the present weaving art to the Pueblos some time after the Spanish-Mexican invasion, formed into rolls and spun on the simple spindle, which consists of a rod about the length and size of an arrowshaft weighted with a perforated disk of wood, horn, or earthenware (pl. 30, figs. 4, 5, 6). After spinning the yarn is stretched and smoothed by taking one turn over a polished corncob and drawing the corncob along, care being taken to regulate the tension, and finally the loose fibers are removed by singeing and the finished yarn laid up in hanks.

FIG. 29.—WHIP FOR FLUFFING COTTON.

Laying up the warp.—

Since the fabric is to be woven to the edges and finished there without sel-
vage or loose ends, the warp is measured back and forward continuously between two rods fastened by means of pegs in the floor at a

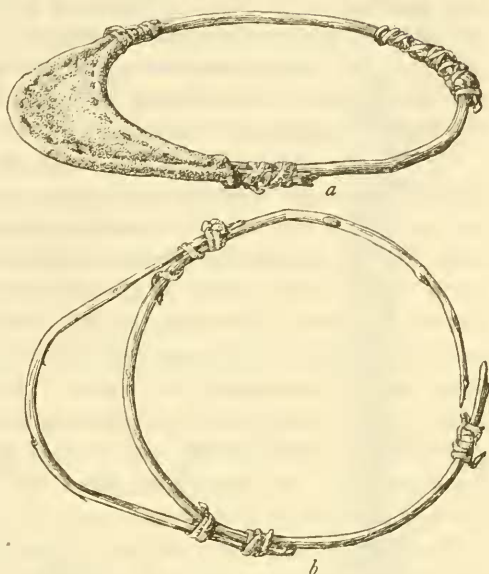


FIG. 28.—a. EYE SHADE COMPLETE. b. FRAME OF EYE SHADE.



FIG. 30.—PROCESS OF WHIPPING COTTON.

proper distance apart, and the warp yarn given a regular spacing with a winding of cord which passes through the loop and over the rod, taking in the next loop, and so forth. The warp ends are thus in a line on the periphery of the rods. The lower rod is tied to the floor or cloth beam, and the upper rod is tied at the ends to another rod which receives the lacing of cord which goes over this rod and the supporting beam (pl. 31).

Setting up of the loom.—The warp, with its rods forming a frame, is then stretched between two beams, the upper attached to pegs in the kiva wall and the lower secured by plaited wool rope to sockets bored in a plank set in the floor, which takes the place of the sockets made in the stone slabs of the floor according to ancient practice. The warp frame is secured to the beams by a spiral winding cord and is not applied as among the Navaho, who run the cord under the beam along the edge of the warp. The warp is kept taut by cords which lash the upper loom beam to the wall pegs and may be adjusted if the web becomes slack. One man can set up the warp, but the services of two are preferable. The loom is then suspended in a vertical position and the weaving begins at the lower border.

The heddles are then applied either for plain, checked, or diaper weaving, as required, all three of these methods being sometimes used on the same piece of work. The dress blanket is usually begun with three diaper heddles and with them is woven a broad band of basket pattern, or "birdseye" in blue. The warp is then reversed in the loom frame and a similar band is woven at the other end of the blanket and the termination of each of these weavings is finished with a cording. The body of the blanket of dark brown wool is then put in with two heddles set for plain weaving. The finishing off of this portion of the blanket is very difficult and is effected by means of slender rods which open the sheds. The weaver beats the weft home with a wooden sword or batten, small in case of the belt loom and large in case of the blanket loom (pl. 30, figs. 1, 2, 3). This is also effected at certain points when necessary with a weft comb, which consists of a strip of wood having teeth cut at one end. At the finish a slender bone awl is used for pressing the weft home. The large batten is used to spring or hold open a shed, as the heddles are only actuated by hand, the Pueblo looms being vertical, and on account of this position none of them have the simple but important device for moving the heddles by foot power, which is practicable on the horizontal webs of the Old World. The horizontal loom, however, was used in ancient Mexico,¹ but was of great simplicity. A primitive shuttle (fig. 31), consisting of a stick on which yarn is wound to and fro, is employed.

¹ Dr. Washington Matthews, U. S. A., Navaho Weavers, 3d Ann. Rept. Bur. Amer. Ethnol., 1881, p. 391.

Several very old blanket weaving tools are in the Museum collection, and considerable difficulty has been experienced in definitely ascertaining their use, especially since these tools are archaic to the present weavers. Figure 32 is the oldest and best specimen of browned oak polished by long use and carved back and front with patterns. It was collected by Mrs. M. C. Stevenson, who was told that the notches on the handle of the *tur i koku*, as it is called, recorded the number of blankets the weaver had made, and the notches on the blade the number of days to be consumed in making a blanket, thus indicating an interesting record or tally stick. The terraced end set with sharp iron point probably served to push in certain threads of the warp to form a special shed for diaper weave. Figure 33 is also of oak with two spurs formed in the end. These probably served as a comb for pressing down portions of the weft. Figure 34, of oak, resembles the



FIG. 31.—SHUTTLE OF PRIMITIVE FORM.

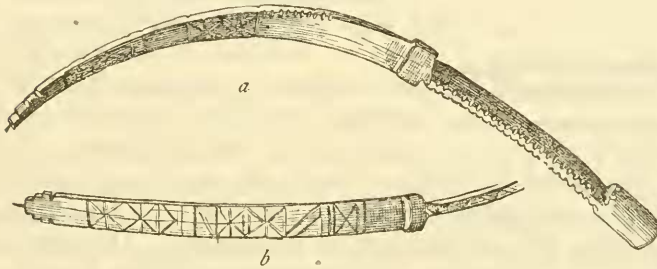


FIG. 32.—a, BLANKET WEAVING TOOL. b, BACK VIEW.

stretching pins used by the embroidery of blankets (fig. 38). This specimen has also tally notches on the side.

Belt weaving.—The greatest play of fancy in the Hopi textile art is in the weaving of belts. Apparently tapes, belts, and other narrow weavings have a long history and preserve to some extent

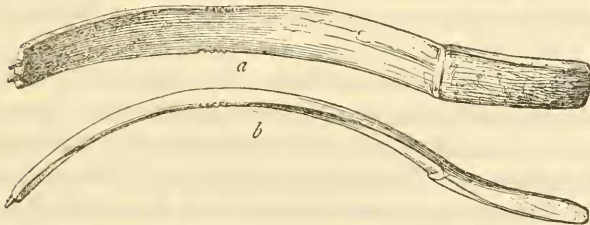


FIG. 33.—a, OAK BLANKET WEAVING TOOL. b, SIDE VIEW.

the primitive art in tools, methods, and designs. Wider fabrics are the product of civilization and have not the long lineage of design that is unbroken

in the narrow fabrics. The handicraft that could produce small and greatly varied patterns with a few warp threads was not perpetuated in the fabrics requiring numerous warp threads. An examination of the hand woven tapes and belts of Europe, Asia,

and North Africa will prove a revelation in design. The Hopi and other Pueblo belts take their place in this most interesting series that has been generally overlooked by students of textile manipulation and design. In the Pueblo tribes the weaver's art antedates the introduction of wool and dyed yarns on which the present industry largely rests.

Hopi belts are woven on a small loom and worked in all respects like the blanket, except for the taking out of threads at the central warps where the design is woven. They may also be woven with reed heddles, an ancient improvement in weaving methods, which renders the separation of the warp to produce the sheds much easier than by the cord heddles, the latter an invention presumably more ancient than the reed heddles. An interesting feature of belt weaving is that the operator's body forms part of the loom illustrated by a figure in the Zuñi family group in the Natural History Building of the United States National Museum.

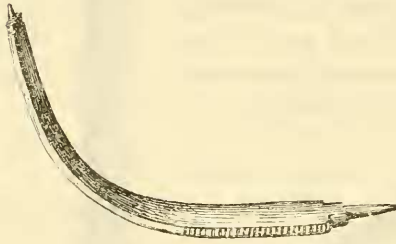


FIG. 34.—STRETCHER AND RECORD IN WEAVING BLANKETS.

The warp, which is attached to a roller of wood secured to a support, is stretched by cords which are fastened to the ends of a yoke passing over the weaver's back and tied to the cloth beam. By movements of the body, the weaver, who sits on the ground in front of her work, can tighten or loosen the warp, an advantage in making the sheds for the passage of the shuttle. This device is in world wide use and appears to be connected with the distribution of weaving from a culture center.

The tools in belt weaving are the same as those employed in blanket weaving but smaller. The roller or cloth beam and the back yoke, however, are not parts of the blanket loom. Instead of using the back yoke of the Pueblos, the Navaho stretch the belt warp in the V-shape opening of a tree fork, which forms a belt loom of primitive aspect, as shown in one of the groups in the United States National Museum.

The warp of a typical belt is set up thus: Two pairs of white threads for edging; 12 red and 12 green on both edges forming plain-woven red and green bordering bands; 60 red yarn and 14 white cotton threads, forming the middle pattern section; and then warps of red and green as above to the other edge, which is bound with two pairs of white threads. Another example has two white edging warps, 12 red, 6 black, 12 red, 20 white, 20 red for center band; and to other edge 12 red, 6 black, 12 red, 2 edging warps. In the pat-

tern band the red threads are worked in pairs, the white always single. The weft is white wool yarn and shows very little in the pattern and not at all in the border bands. The specimen is $1\frac{1}{2}$ inches wide and is probably Zuñi.

In Hopi belt weaving the heddles are not applied for patterns, but continuously, to alternate warp threads as in plain weaving, the designs being formed by lifting the required warp yarns by hand with a small wooden blade or batten. This interesting combination of hand and machine work points to a more primitive method as in the Navaho, Chilkat, and Salish weavings.

As remarked, the belts of the Hopi and Zuñi exhibit great skill in technic and ingenuity in pattern. The warp and weft are often of the same yarn, giving uniformity of texture, but usually the warp is partly of yarn of the same thickness as the weft yarn and partly smaller. This arrangement furnishes a fertile field for the play of design. The warp in the central or pattern band of a belt is generally of small white yarn and another color of larger yarn, usually red, the former working out white pattern grounds, having raised figures in red warp, the latter contrast being produced by the difference in size of the yarns, the small warp being worked singly and the larger in pairs.

Wedding blanket of cotton.—The Hopi wedding blanket, following correct custom, should be of plain white cotton fabric, resembling coarse canvas woven in the hand loom (fig. 22). During the year following the investiture of the bride with the wedding blanket it is embroidered on the upper and lower borders with symbolic patterns in black, green, red, and rarely yellow yarn, and on each corner is fastened a large tassel which is formed on a grooved flat stick about which the material for the tassel is wound. The upper corner tassels are usually white and smaller than the lower, which are of black and red. The embroidered band on the upper margin of the blanket is narrower and simpler in design than that of the lower, whose pattern represents rainclouds, rain, squash flowers, and butterflies, applied in a very pleasing ensemble. No embroidered wedding blankets antedate the period when dyed yarns could be procured from the trader and all known specimens are worked with worsteds, but many were collected before aniline colors came into use. As to the character of the wedding blanket before wool was introduced there is no information, though following the method employed in the kilts of the Snake society the garments may have been ornamented with painted designs. It is probable, however, that no large woven blankets were made in ancient times, and no wide fabrics have been found in the cliff dwellings, the widest being 26 inches from Grand Gulch, Utah.

Weaving of kilts.—The kilts worn by Hopi priests in ceremonies are of two kinds, plain woven cloth, which is made of coarse cotton yarn strongly fullled and resembling canvas, decorated with symbolic designs in red, black, and white paint worn by the Snake and Antelope fraternity; and the other of similar canvas decorated with woven designs in bright worsted, worn by the Flute and other fraternities. These are woven in small looms, the tools and procedure be-

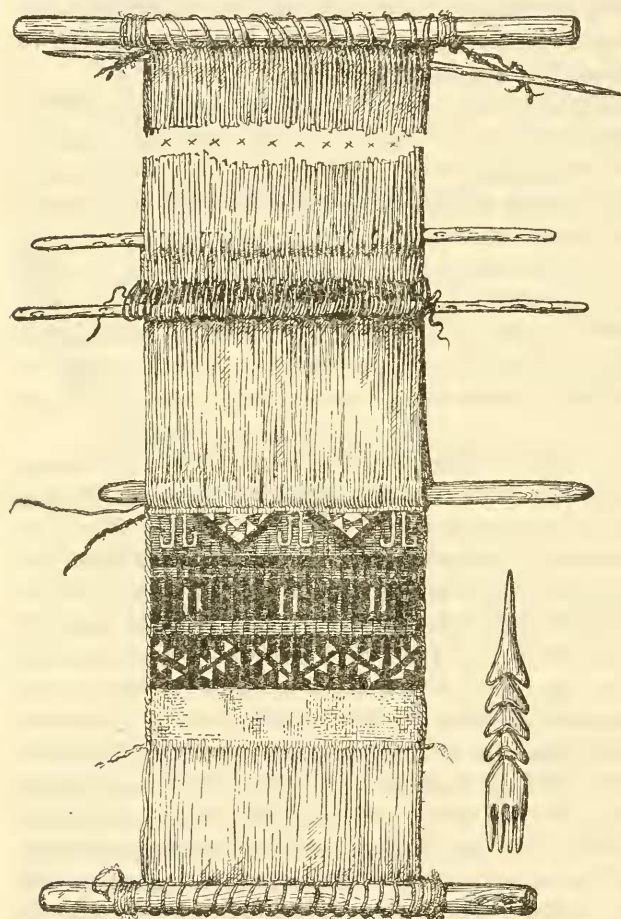


FIG. 35.—SASH LOOM WITH WEAVING IN PROCESS. WEFT COMB (TO RIGHT).

Weaving of sashes.—Sashes worn in ceremonies are panels of plain weaving of cotton or wool, decorated at the end with designs in colored yarns and terminating in a fringe. They are woven plain for part of the length and then the heddles are adjusted to work in the patterns in yarns (fig. 35). Two sections or panels thus made are sewed together at the upper end with a roving of cord. In most specimens in the Museum the warp and weft are yarn of the same size. Where the decorated weaving begins a much finer weft is used.

ing the same as in the blanket loom except that in the second variety the heddles are set to work in the patterns in colored yarns. Sometimes, however, the designs are worked in by embroidering after the piece is finished in the loom. The upper border is corded with black yarn. The lower edge is finished with a braid of black wool sewed to the margin. The corners are finished with small tassels. These kilts are 20 inches wide and 39½ inches long.

The effect of this is not to alter materially the surface of the cloth but to narrow the weaving which would have been necessarily much wider on the addition of the worsteds used in decoration. There is also an advantage in narrowing the sash at the end with the effect of making it more graceful. Specimen Cat. No. 166318, U.S.N.M., Hopi Indians, Arizona, collected by James Mooney, has a small warp and a thicker weft. At the beginning of the embroidery the weft and warp cords are made of equal size. This again produces a tapering form and distinctly finer cloth. These sashes are made 9 inches wide and 44 inches long to 10½ inches wide and 48 inches long.

Braiding the sacred white sash.—A typical example of the sacred sash (Cat. No. 22953 U.S.N.M., collected by Maj. J. W. Powell) is composed of 216 threads of white cotton about the size of small package cord braided into a band 8 inches wide and 61 inches long to the termination of the solid braiding (fig. 36). The work is started midway of the cords where a twining is applied temporarily and proceeds toward either end, where the cords are divided into 12 tresses braided into narrow tapes for a short distance. Rings are now slipped on over the cord and secured and the cords divided into sixes are twisted together, hanging down as 36 twists forming a long fringe. The rings (fig. 36), which number 18, have an annular core of corn husk wound with cord and are secured to the cord bundles by tying at the termination of the braided portion of the tape. This most remarkable example of braiding is worked with great skill, and the finished texture is even and compact. No tools are required for this work, and it is only necessary after the braid is begun at the middle to secure this portion between two wooden clamps in order to suspend the mass of cords from a support in the wall. The cotton employed in these sashes is native (the only Pueblo aboriginal cotton that has survived), grown exclusively for ceremonial purposes and prepared by men in accordance with traditional religious usages. Plaited sacred sashes were used by all the Pueblos; it is not known, however, that all the tribes made them; probably most of the tribes procured the sacred cotton or the finished sashes from those Pueblos who lived in the area where the cotton plant could be grown. The art of making the sashes is ancient, as the remains of a square,

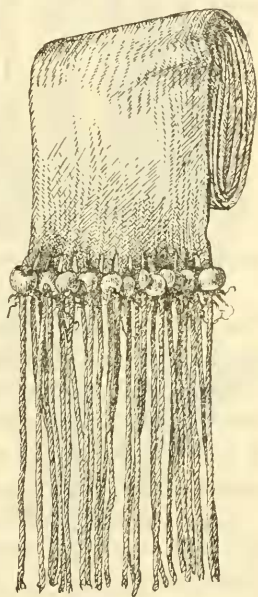


FIG. 36.—BRAIDED SACRED WHITE SASH.

braided (sennit) sash fringe with rings found in Bear Creek Cave, Blue River, Arizona, show.¹

These sashes, which are kept white by the application of kaolin, are used by the Hopi priests in the Nashnaiya ceremony. They are secured at the waist and hang down in two panels on the left side. The Zuñi use them in the sword swallowing ceremony of the great fire fraternity.² The Hopi name for them is *wuko kwewa*, great sash. It is possible that this sash may be of Mexican origin.

Embroidery.—The Hopi embroider ceremonial kilts, sashes, and wedding blankets, and to a slight extent the woman's dress for everyday wear. The art as it exists at present appears to have been acquired from the white man, but it may also have been derived from weaving, as in the raised woven work on the hems of the women's dress or the raised figures on belts.

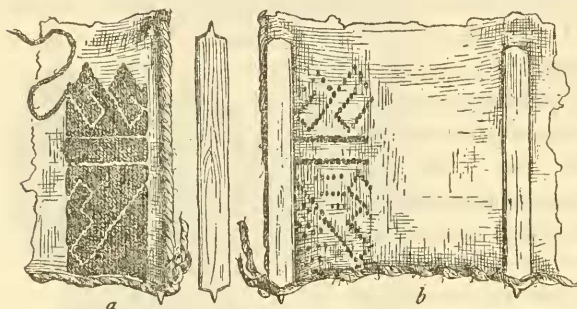


FIG. 37.—*a*. EMBROIDERY ON SASH. *b*. WORK STRETCHED. WOODEN STRETCHER (IN CENTER).

The material to be embroidered is stretched by means of strips of wood having points at the extremities (fig. 37, *a*, *b*, *c*), and when used are buttoned into the goods and the working done with a fine bone awl (now with a darning needle). Larger stretchers, consisting of a strip of notched wood with a pointed rod lashed to the ends, are useful for larger embroidery spans or for stretching blankets (fig. 38).

Tassel making.—Tassels are important adjuncts of the ceremonial blankets, and are sometimes of complicated structure. Ordinary blankets are supplied with rudimentary tassels or "tags" at the



FIG. 38.—LARGE STRETCHER FOR BLANKET WITH ADJUSTABLE PINS.

corners, and completed wedding blankets have bunch tassels made by the ordinary process; sometimes the shank of the tassel is overlaid with colored cords in basket-weave. The tassels for the white braided sash (fig. 36) are made on a tassel stick, a very old specimen of which is shown in figure 39*a*, a section of the end showing the grooves. A cord is laid on the longer groove and brought down the sides and a cord is wrapped continuously over it on the stick (fig.

¹ Hough, Walter, *Ancient Culture of the Pueblos of the Upper Gila River*, Bull. 87, U. S. Nat. Mus., Washington, 1914, fig. 159, p. 76.

² Mrs. M. C. Stevenson, *The Zuñi*, 23d Ann. Rep. Bur. Amer. Ethnol., pl. 18.

39b). The under cord is then cut at the point indicated in the shorter groove, the loops slipped off the stick (fig. 39c), and on it is laid a ring of cornhusk, which forms the core of the tassel; the loops are rolled over this ring and the resultant tassel ball formed. This is an example of remarkable imagination and ingenuity.

Knitting.—Many of the Hopi, in common with the Navaho, Zuñi, and other Pueblo tribes, are familiar with the art of knitting, but usually practice it only in the making of leggings of blue yarn. Knitting was learned from the whites, at what period it is difficult to ascertain. An unfinished piece of knitting with wooden needles in place was brought presumably from cliff ruins in northern New Mexico by Dr. Washington Matthews, but the circumstances of its finding are not now known. A coarse horsehair legging and one made of brown (buffalo?) hair were also collected by Dr. Matthews. A fabric resembling the crochet bags which have a wide distribution in the Eastern and Western Hemispheres and are especially common in South and Central America has been found in archeological sites in northern New Mexico and Arizona; no specimens, however, have been found in the southern portion of the Pueblo region. A hook or needle would be indicated for the making of this fabric,¹ but no implements of this character have been discovered except a needle of bone² in ancient sites; and it is probable that this method, like knitting, was comparatively recently acquired.

Hair cord.—One of the most primitive textile materials is hair, and the kind that is most available is human hair, which without doubt was worked into cord from the earliest times. Among the Hopi hair cord is made by women and at present the art is practically limited to the making of cord used in the coiffure of women. There is evidence, however, that formerly whenever a cord of peculiar strength and wearing quality was needed, cord made of human hair was employed. Some of the earlier specimens collected by the Bureau of Ethnology show uses of human hair cord for a netting over gourd canteens, for the strings of marionette birds, and in ceremonies, etc. On the acquisition of cattle and the horse an abundant

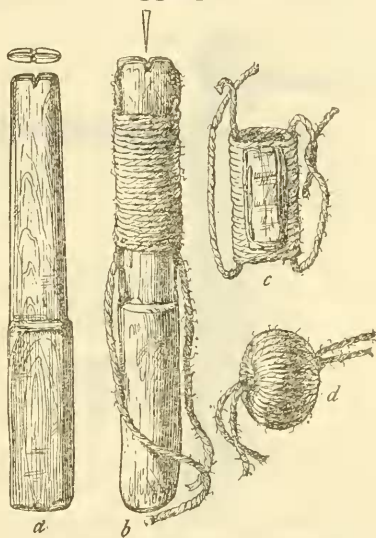


FIG. 39.—a. OLD TASSEL STICK; b, c, d. TASSEL STICK AND PROCESS OF MAKING TASSEL. GIFT OF EMRY KOPTA.

¹ See Mason, Basketry, Ann. Rept. U. S. Nat. Mus., 1902, p. 380.

² See Hough, Museum-Gates Expedition, Ann. Rept. U. S. Nat. Mus., 1902, pl. 13.

supply of the material became available. The hair of horses and cattle had some use for lariats, bridles, cinches, and other parts of horse trappings, but not to such an extent as among the Mexicans. It was used in religious paraphernalia, on dolls, etc., to represent human hair. The banner placed above the kiva hatchway, to announce that a ceremony was going on within, is decorated with red dyed horsehair. Hair cord was made by hand or with the spindle. The whirling cord twister, known to the Mexicans and southwestern Indians, was used by the Hopi (fig. 40). (See also p. 253.)

Weaving rabbit-fur robes.—A fabric that long antedates woolen blankets in the Pueblo region is made from rabbit fur cut into strips, wound around thick cord and joined by twined work of wool, cotton, or hair cord (see background, pl. 31). The large blankets

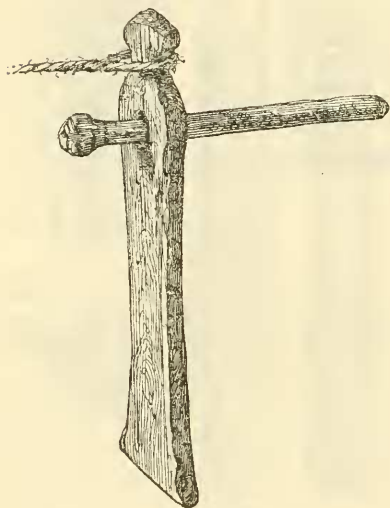


FIG. 40.—WHIRLING CORD TWISTER.

thus made are warmer and more flexible than dressed fur skins. In ancient times the cords were overlaid with strips of downy turkey feather and formed into robes and body garments. These were still in use in 1540, but no mention is made at that time of rabbit fur robes. The making of this fur fabric was a widespread aboriginal industry all over the Rocky Mountains, from the mouth of the Columbia to Mexico. There are references to their use among the eastern tribes.

In making fur robes great lengths of fur-covered cord are first prepared, and this generally takes a long time, unless rabbits are plentiful. The skins are cut in strips about a quarter of an inch wide, dampened and wound spirally around the cord, and when the skin is dry it remains rigidly in place. The width of the robe having been determined, a section of the fur cord is bent over and the warp threads tied to it at intervals. The cord is laid to and fro continuously as it is twined in the warp threads, the robes thus having a succession of loops on two edges. When the robe is of proper length, the warp cords are tied to the last breadth of fur cord. The resultant fabric is about an inch thick and warm, but gives a most excellent harborage for fleas and other vermin.

Wound work.—The Hopi practice a variety of textile work that is intermediate between basketry and weaving. The basis is a strip of rawhide or other flexible material wound with colored yarns in a counted order of winds, so that when a number of these strips are

laid side by side a pattern is built up. These strips are joined to form anklets, and it requires considerable precision on the part of the worker to wind the strips, which alone are meaningless, but when joined form a pleasing design (fig. 41, *a*, *b*, *c*). The method is very like that of the coiled basket, resembling closely that variety known as "lazy stitch."¹

The method, however, may be more related to embroidery with quills, which was interpreted in wampum and later in glass beads. Some of the Plains Tribes worked patterns in braided quill on string, which, wound around a pipe stem or other object, revealed the design in the mind of the artist. It is probable that this work was known to many tribes in America, but it has survived in only a few.

Hopi quillwork was confined to the making of anklets identical with those described, formed of worsted and rawhide. Porcupine quills were used and the basis is horsehair. The quills were dyed, split and worked over the hair with a series of half hitches (pl. 32). The Zuñi made similar quill anklets and the method was also known to some of the Rio Grande Pueblos. It is probable that these objects were distributed among some of the Pueblos through exchange.

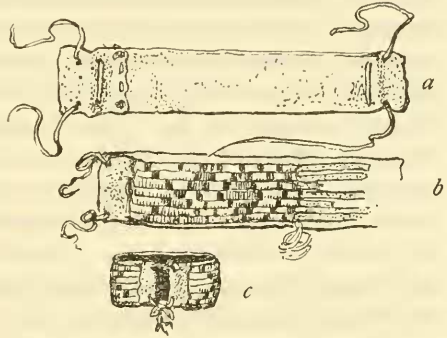


FIG. 41.—WOUND WORK ANKLET. *a*. BACK VIEW, SHOWING LINING; *b* FRONT VIEW; *c*. COMPLETE.

BASKETRY.

The working of pliable elements of vegetal origin into basketry and cognate textures is an important feature of the economic life of the Hopi. The great development of the potter's art in this region has not apparently diminished the necessity for basketry, which has a range of employment here comparable with that in other strictly basket regions. The grosser use to which basketwork is put is in the construction of wind breaks in the fields and the twined weaving employed is the simplest and most primitive method known to man. Twining, however, is not well represented among the Hopi, the only instance of its use being the grass stem mat in which wedding blankets are rolled.² There have been collected in the Hopi pueblos numerous twined baskets, some of them very old, but these baskets are of Ute workmanship and have been brought to the Pueblos by exchange. Baskets of extraneous origin will be mentioned later.

¹ Mason, O. T., *Aboriginal Basketry*, Ann. Rept. U. S. Nat. Mus., 1902, p. 249.

² *Idem*, pl. 103.

The use of flat splints or strips gives rise to basket structures of one type having several varieties in complexity, passing from checker to twilled and finally to diaper as the highest expression. Generally this construction produces thin, weak textures familiar in the mats made by many peoples. The Hopi made mats, *apa*, from ancient times down to several decades ago. Formerly throughout the Pueblo region it was customary to enwrap the dead in matting before burial, traces of this material being found in ancient cemeteries.¹ Matting is common in cliff dwellings and ceremonial caves.²

The matting hoods over fireplaces are the only survival of this textile among the Hopi. The basket that most characterizes the Pueblo Indians is made from strips of yucca leaf. They are usually in twilled and sometimes in diaper weaving. The forms, which are rarely graceful or regular owing to the roughness of the material, are circular trays often large; squarish baskets with vertical walls; and somewhat bottle-shape baskets. The splints are bent over and sewed to form the edge, and frequently a wooden hoop is used to strengthen the rim, a feature also of ancient baskets of this type.³

Neatly formed head rings or pottery jar rests, forehead bands, belt weaver harness, and cradle head bows are of twilled weaving. The Hopi specimens differ little from similar objects made by other Pueblos. None of the Pueblos ever made lids or covers fitting over or telescoping the basket receptacle, a practice rarely absent wherever this style of basket weaving is pursued in other parts of America and in the Eastern Hemisphere. American examples may be cited from the Pimas, Mohaves, Cherokees, Choctaws, and other southern tribes, Mexicans, Central Americans, Guianians, Peruvians, etc.

Wicker basketry, uncommon in America, is prevalent among the Hopi and Zuñi and little used by the other Pueblos. The Hopi wicker baskets are the most artistic to be found in the world, and here the decorations on wickerwork reaches its highest perfection, presenting a surprising range of color and symbolic design. The forms decorated in color are plaques, and occasionally small deep baskets; forms with structural decoration are oblong trays. Carrying baskets and one of the two varieties of cradles are of wickerwork. The frames of some of the masks are made by this method. It is worthy of remark that wicker weaving is almost confined to the Pueblo or Oraibi. The common material for wicker basketry are the stems of *Rhus*, tough and strong, forming the frame work, and the stems of *Bigelovia graveolens*, *Chrysothamnus graveolens*, and *Verbesnia encelioides*, the latter desert plants, commonly called rabbit brush, furnishing innumerable stems of even size, rather soft, but

¹ Fewkes, 22d Ann. Rept. Bur. Amer. Ethnol., 1900 (1904), fig. 60, p. 97.

² Hough, Bull. 87, U. S. Nat. Mus., 1914, pl. 16.

³ Idem, p. 88.

wearing well. The stems are gathered, peeled, rubbed to remove slight irregularities, and dyed. Dyeing is done by various processes and with various materials, subject generally to individual methods and experiences. Body colors as black, white, green, red, and brown, are washed on the splints, or sometimes applied after the basket is finished, the medium being an emulsion of fatty seeds of melon, etc., or saliva, or both, formed by chewing seeds, mixing the resulting liquid with paint and applying to the splints with a tuft of rabbit fur. The colors are ground and mixed on a small flat stone. The materials are kaolin or limestone, white; soot or coal, black; copper carbonate, green; red, brown, and sometimes yellow, iron ochers. Dyes proper, mordanted or not, are subject to the fertile knowledge and inventiveness of the Hopi women, who produce a considerable range of colors, often of great delicacy and beauty. This familiarity with dyes is shown not only in baskets, but in the preparation of bread, which is often given a variety of colors with vegetal dyes. Some little information as to these colors can be set down as follows: Blue is derived from larkspur flowers; dark blue, beans, shells of sunflower seeds, and indigo; green, yellowish to olive, from composite flowers and leaves; yellow, from *Chrysothamnus* and other desert composite flowers; orange yellow, from saffron flowers; red, from bark of alder, berries of rhus, and flowers of the cockscomb; brown, red-brown, and yellow-brown, from plants of *Thelesperma*; black, from ink of resin and iron alum as in dyeing leather. Shades of pink, carmine, violet, and lavender are produced apparently by manipulation of the color from cockscomb. As a rule all these vegetal dyes on wood fade rather soon, especially when subjected to actinic light.

The weaving of wicker baskets is begun by crossing at right angles a number of the rods which form the foundation. The crossing area is sewed with splints, the sewing forming a square area divided into parts by a diagonal stepped line (pl. 34, fig. 1). The great majority of wicker baskets are begun in this manner and very rarely in older specimens is there a modification of the plan. The radiating rods are then diverged evenly and the tangential element worked in. If enough radiating rods have not been provided to fill out the circumference, other rods are added as needed. The edge is finished by a spiral sewing of yucca leaf after the ends of the radiating rods have been bent over evenly. This edging is painted red.

Designs on wicker baskets are similar to those on the coiled baskets, but show greater freedom. They are tangential, while those on the coiled baskets are radial, in both cases due to the technic of the design-bearing element. The radial designs are forced from center to circumference, while the tangential designs are forced to expand from side to side. An identical bird design by the two methods

shows this (pl. 33, fig. 1; pl. 38, fig. 6). Occasionally in modern coiled baskets the design is aided by overlaid sewing, to show the beaks and feet of the birds, for example. This is an innovation.

The foundation of coiled baskets is a bundle of grass stems, *takashu* (*Hilaria jamesii*) being used. The sewing, which covers and holds together the coil, is of strips of yucca leaf split with the thumbnail into bands of equal width and smoothed by drawing under the pressure of the thumbnail. The wicker basket requires no tools, but the coiled basket demands an awl, preferably of bone, as this substance does not chip or cut the sewing. The beginning coil must be slender and pliable to take the short turns, hence it is formed of shredded yucca leaf instead of the harsh grass, the latter being added when the coils grow larger and less curved. The coil grows less again on the outer edge of the basket where it tapers to a finish. The lining strip or sewing is secured at one end, passed over the coil, through a hole made by the awl, engaging some of the previous turns and foundation grass stems, and so on until used up, when another strip is started in. In case the pattern requires a color at some point in the sewing, a splint of the color desired is started in. The pattern is regulated by counting the stitches. Both the coil and the sewing are kept moist by burial in damp sand, which the basket weaver keeps near her. These baskets are very strong and serviceable, and more of these are made than of any other kind. They resemble, in the size and substance of the coil, the baskets of North Africa; but they are of ancient use in the western and northern Pueblo region and not the result of foreign influence. Coiled baskets are made in the three towns on the Middle Mesa.

Coiled basket forms are circular plaques, most numerous and sometimes very large; deep bowl forms, sometimes at present with un-Indian handles and covers; and vase forms which are modern. About 1872 coiled sombreros were made as an innovation. Though the coiling was the finest ever made by the Hopi, these hats were too heavy for comfortable wear.

Mention should be made of the baskets acquired by the Hopi from other neighboring tribes. At the time of the explorations by Major J. W. Powell in Tusayan, great numbers of these baskets were collected and at first thought to be representatives of the Hopi basket art. These are now in the United States National Museum. They consist of twined pack baskets and pitched water bottles of the Utes and Apaches; strong fine coiled bowls and twined pitched water bottles of the Havasupai; coiled bowls of Ute-Navaho and water bottles probably from the Mohave. These were also rod and splint baskets, evidently very old, whose origin is unsettled. They were found also at Zuñi and in the Rio Grande pueblos. The largest collection of these interesting baskets is exhibited in the United States National

Museum (north alcove, first floor). A descriptive label for these baskets written by Prof. O. T. Mason is as follows:

Made up on a coil of small rods or splints of willow or *Rhus aromatica*. The composition of the foundation coil characterizes basketry of this type as "single-rod coil," "rod-and-splint coil," "two vertical-rod coil," "three-rod coil," "two-rod-and-splint coil," "splint coil," and "straw coil." The coils are held together by an over-and-over sewing with osier splints which pass around one coil, under a small rod or splint of the under coil, each stitch interlocking with the one underneath. The ornamentation of these baskets is produced by substituting dyed or natural black splints and the figures are mostly geometric. The borders are fastened on with the plain stitch of the coils, or with a row of false braid effected by passing a single splint backward and forward under the stitches of the last coil.

They are smoothly and strongly made of well-prepared material, decorated with archaic patterns, follow in the main the forms of ancient pottery, and their appearance suggests great age. It is probable that they are the work of some ancient Pueblo tribe now extinct, and have been preserved among the Pueblos for hundreds of years. Mr. Cushing wrote that some of these baskets had been recovered by the Zuñi from prehistoric deposits. So far as known, no specimen has been found by explorers of the cliff dwellings and none occur in the remarkable basket finds in Grand Gulch, Utah, described by Mr. George Pepper.¹ Some of these interesting baskets are figured by Professor Mason.² Baskets of the thick coil type are made by the Pima and Indians of northern Mexico, usually for coarse construction as in granaries and storage baskets. They are not covered with sewing as in the Hopi examples. The Hopi variety of coil basket has an ancient history in the Pueblo region, specimens having been found in the Bear Creek ceremonial cave on Blue River, Arizona.³

The tools used in basket making are simple, the awl being most in evidence though needed mostly for coiled basket making. This important tool, which serves for many uses, is at present made from the leg bone of the sheep, but was formerly made of deer bone. It is brought to a fine smooth point on a whetstone and constant use in sewing gives it an exquisite polish. A metal knife and of recent years even scissors, form part of the basket maker's equipment; formerly chips of flint or obsidian may have served. A polishing stone sometimes grooved may be used, though the rods may be smoothed by drawing them over sand rock in place on the mesas. A wrench of antelope or goat's horn (pl. 46, fig. 4), like those employed in straightening arrow shafts, may be used for the larger rods, ancient basketry owes its excellent craftsmanship to this tool.

¹ Ancient Basketmakers of Southeastern Utah. Supplement to Journal American Museum Nat. Hist., N. Y., vol. 2, No. 4, April, 1902.

² Aboriginal American Basketry, Ann. Rept. U. S. Nat. Mus., 1902, pl. 28.

³ Hough, 1902, Culture of the Ancient Pueblos, Bull. 87, U. S. Nat. Mus., 1914, pl. 24.

The ornamentation of Hopi basketry, pottery, and other articles is never merely aesthetic or employed for the sensuous pleasure in beauty of form and color. It expresses itself in symbolism of religious meaning, the outgrowth of nature worship which embraces and gives import to design, color and even material. The origin of art in religion and its inextricability from belief, a feature which seems to vanish with civilization, is nowhere better shown than among the Hopi nature-worshippers. The significance of a decorated basket thus is far deeper than its beauty and usefulness and greater than the craftsmanship that created its material structure. The color symbolism is based primarily on the geography of the spiritual domain. The being who rules the northeast quarter is yellow, and all things in nature about him are yellow, the southwest quarter is blue; the northeast quarter is red; the southeast quarter is white; below is black, and above all colors.¹

The designs on Hopi basketry are not as varied as those on pottery, and are less intelligible on account of the difficulty of expressing ideas in the textile medium, which often reduces them to the lowest terms of convention. The commonest designs are of birds or characteristic parts of birds. The snake is sometimes found. The antelope appears to be the only mammal used in basket decoration, though the mountain sheep may have been represented. Clouds, the rainbow, and perhaps stars are frequently noticed in combination with birds. Kachinas often in elaborate designs are in frequent use, the commonest being the corn maid, avatch or speckled kachina, and man eagle. The tendency in modern baskets is to make these figures more realistic and to accomplish this weaving elements never seen in ancient work are employed. There are also designs in bands or individual figures which have been conventionalized beyond present explanation. On this point it may be said that interpretations of designs secured from modern basket makers are apt to be delusive. The designs must be traced step by step from known designs or parts of designs by the method pursued by J. W. Fewkes on the Sikyatki pottery.² Doctor Fewkes used as a basis the designs on paraphernalia made by the fraternities for the various ceremonies current among the Hopi. Except a few interesting pieces of pottery from Oraibi, in which the ancient decorations had survived to some degree, the native ware collected in 1872 and succeeding years showed great deterioration. This is not true of basket designs, other textile designs, and designs used to decorate religious paraphernalia.

The designs shown (pls. 33-41) were selected from the large series in the United States National Museum, from photographs of the "Basket Ceremony," and from specimens in native dyes collected

¹ Hough, Hopi ceremonial pigments, Ann. Rep. U. S. Nat. Mus., 1901, p. 467.

² Published in the 17th Ann. Rept. Bur. Amer. Ethnol., pt. 2.

by the writer. They show the unrivalled skill of the Hopi as designers and their inherent aesthetic proclivities. It is hoped they may prove useful in the work of those who are seeking to institute a school of American design which is attracting a lively interest nowadays.

The designs of the Hopi basket maker deal exclusively with life and nature forms, and these may with more or less facility be identified. There are many examples, however, which show the disintegration of such designs sometimes to small units and often these units are placed in geometric combinations which become difficult of solution. It will be seen that the majority of designs are based on the bird form, which is evidently the foundation of most of the geometrics.

In Hopi baskets the color combinations are rarely or never in the order of the symbolic meanings of colors. The wicker baskets are characterized by the greatest variety and brilliancy of colors in contrast with the plainness of Zuñi wicker plaques. The coiled baskets are more sober in color than the wicker and often the coiled plaque is decorated only in two or several shades of natural yucca. The cause of this difference may be in the indication that greater skill in dyeing was possessed by the Oraibi than by the Middle Mesa basket makers. It seems likely also that yucca splints are less susceptible to dye than the brush splints.¹

Designs are arranged: In two; two with two secondary; four; and four with four secondaries. Designs containing elements in 5, 6, and 7 may be regarded as departures from custom in the interests of modern ideas of beauty or completeness (pl. 33, figs. 5, 6; pl. 35, fig. 6). Three part designs are not found. Designs of more parts utilize the septums of wicker basket structure in simple alterations and repeats (pl. 37, fig. 5). Occasionally the sky band is drawn across the field of a coiled basket, as was the custom in Sikyatki pottery.² (See pl. 40, fig. 3.) This band never appears in wicker baskets.

The concave field of the basket is the sky and embraces the whole circle of the visible heavens, in this respect resembling the decorated area of Sikyatki pottery bowls as observed by Dr. J. Walker Fewkes.² The center of the field in wicker basket plaques, an usually undecorated circular space is the heart of the sky, the above. The margin line near the edge of the basket is the horizon. In the free area are placed birds, clouds, etc., and any design worked therein is represented as in the sky.

The common arrangement is indicated above, but several different dispositions of the areas are noted. In the case of Kachina figures or masks the whole area is occupied, the demarcations of sky hori-

¹ Hough, A collection of Hopi ceremonial dyes and pigments, Ann. Rept. U. S. Nat. Mus., 1900, pp. 465-471.

² Fewkes, 17th Ann. Rept. Bur. Amer. Ethnol., pl. 2.

zon, etc., being obliterated. Sometimes the whole area is occupied with bands of geometric or continuous figures in squares. Several examples show a two part design, probably birds outlining an elliptic or bilobed figure, undecorated, obliterating the central circle (pl. 37, fig. 6). Rarely in wicker baskets are the radiating arms of the prime compass points represented (pl. 35, fig. 4), but frequently in coiled plaques (pl. 38, fig. 1; pl. 40, fig. 2; pl. 41, fig. 1). The middle portion of coiled and wicker plaques is differently treated. In wicker plaques the central area is usually decorated only with a stepped diagonal line in the placket in the center formed by overlaying the crossed splints, rods which form the skeleton of the basket. The circular area is bordered with a band of alternating white and colored rectangles (figures in pl. 35 and others). In the coiled plaque the design begins generally at the second turn of the coil. In bird designs the beaks are placed to the center of coiled baskets and to the margin in wicker plaques (figs. in pl. 33); for coil (pl. 38, figs. 5, 6; pl. 40, figs. 2, 3).

The designs on wicker plaques figured show birds and clouds in recognizable, somewhat realistic forms (pl. 33); modified by the designers, but recognizable (pl. 34); and converted entirely into geometrics (pl. 35). Plate 36 shows kachina and other special designs. Plate 37 shows in figure 1 four antelope in simple line design, which may be compared with the fine realistic designs on the coiled plaque plate 40, figure 1. Figures 3-6 of plate 41 are motion designs and special designs.

The designs on coiled plaques show birds and birds and clouds (pl. 38); four and two bird conventions (pl. 39); antelope realistic design and complex bird designs (pl. 40); and designs of birds and perhaps snakes showing motion (pl. 41).

As designs become more conventional they tend to overlap; thus, birds and clouds represented as stepped figures can not be distinguished. Likewise the bird or cloud form may be reduced to a star symbol (pl. 36, fig. 1), or a dragonfly which would be represented as plate 34, figure 1.

The bird represented is doubtless the eagle primarily, but other birds may occur. The bird in figure 6, plate 38, suggests the bird figures mounted on a rod and pedestal used in certain ceremonies of the Hopi and especially among the Zuñi.

STONE.

Although their arts have been modified by contact with the white man, the Hopi possess a number of uses of stone inherited from another period. These are the metate and mano for grinding corn and the stone hand hammer for working as well as sharpening them;

abrading and polishing stones; the slab for baking bread; mortars and pestles, paint mortars and slabs; slabs for potter's work; and covers for ovens, etc.¹ These are still made by stone art methods, but the Hopi possess and use stone axes, mauls, hammers, knives, arrowheads, "hoes," etc., found in ancient ruins and now having a secondary employment for domestic and religious purposes. Constructions with stone are practically the same now as in past centuries, and pictographs are still cut in rock faces; on the whole the attitude of the Hopi toward stone, except in minor features, has been little changed by the introduction of iron. It may be said in explanation of this unprogressiveness that the introduction of iron has been slow, in small amount and comparatively recent, due to isolation of the villages, and that no Hopi has yet become an ironworker. The Hopi probably received their first iron from the Rio Grande Pueblos in the form of crude, heavy hoes (see fig. 1). They were also in touch with the trade in iron arrowpoints, a trade at one time of considerable proportions and extending over a vast territory, causing the rapid disappearance of the stone arrowhead. The iron arrowhead appears to have been brought from the Plains tribes by the Taos Indians and traded to the Pueblos. The Utes, Navaho, and Apache retained the stone arrowpoint in large measure until the recent introduction of firearms, while the Pueblos had discarded it except as fetiches long before this period.

The hafting of stone axes and hammers, examples of which have been encountered among the Hopi and other Pueblos, probably in few cases follow the ancient methods, but is a crude application of ingenuity to accomplish the result, much as the problem of mounting an ancient specimen would be solved by a civilized man to whom the genesis of the implement was unknown.

Archeological objects picked up from ruins are valued as fetiches and are placed on the altars or employed in other ways by the secret orders (see fig. 47). Some of these specimens have come down apparently through many generations in Hopi fraternities and are entrusted to individuals for safe-keeping. Other archeological artifacts have been put to practical uses, especially axes and hammers, the resultant misuse without sharpening, tending to reduce an axe to a form resembling that of the hammer and the hammer to a nodule. In many cases metates recovered from village sites have resumed their utility in Hopi households. Stone fetiches were not often made by the ancient Hopi and there is no evidence that they ever made hard stone fetiches in number like those of the Zuñi or from ancient sites on the Tularosa River, but figurines worked from soft sandstone and painted representing zoic and anthropomorphic be-

¹ See exhibit of archeology, second floor, and family group case, first floor.

ings and forming part of the paraphernalia of altars were made.¹ The manufacture of these required little patience and skill.

The Hopi fetiches of stone were commonly natural, such as concretions or stones of suggestive shape or color. These were rarely and then only slightly worked, perhaps in the way of a groove for the cord or other chance modification, as the drawing of an eye, the addition of paint, etc., to identify the fetich. Beads of stone and worked shell, while prized and regarded as indispensable for ornaments as a sign of wealth and of the favor of the gods, are not made by the Hopi, but are secured in trade with the Zuñi and the Rio Grande tribes. Turquoise mosaic earrings, constructed by imbedding small plates of the stone in gum covering a rectangular wooden tablet and finished by grinding and polishing, appear to be still made by the Hopi in perpetuation of the ancient art (see pl. 27, fig. 2).

CLAY.

The culture of the Hopi is inseparably connected with the fictile art. Knowledge of the properties, uses and value of clay was thorough and was displayed in the mixing and application of this substance to house building, as mortar in the setting up of stone walls and as plaster for finishing walls, roofs and floors. The most striking use of clay, however, was in pottery, whose high development and wide employment in every avenue of social life marks a characteristic and remarkable feature of Hopi art. The diversity of pottery forms appears to have been in response to the limitations of the environment (see prefatory remarks on basketry) and the presence of excellent clays. The explanation may not be as simple, since there is also required a certain genius and adaptability in the people undergoing development, these qualities differing widely among groups of men placed in the same environment. There is also to be considered the contact with older and more advanced tribes. It is instructive to note here the comparatively negative effect of Pueblo culture and semi-arid environment on the Navaho and Apache intrusions in the Pueblo region. Those tribes which have sojourned in this environment for nearly 800 years have developed nothing resembling Pueblo material culture and have absorbed little from contact with the Pueblos and retain practically unchanged the characteristics of their sub-Arctic culture. Thus they have never made pottery or erected stone houses or taken the close affiliations of village life which mark the culture of the Pueblos.

The making of pottery among the Hopi is exclusively woman's work and they carry on all the operations without other assistance. The clays are found in small seams between the great beds of sand-

¹ See case of fetiches, north side.

stone forming the mesas and must be dug out and carried to the village with considerable effort. Several varieties of clays whose qualities are known to the potter are found in the various strata of the cliff. These form the basis of the ordinary ware made in the pueblo of Walpi. Very fine clay, which was used by the ancient potters, is taken from the mesa near Sikyatki. This clay is used for very fine work by one or two of the Walpi potters. White clay of the proper quality for washing the surface of vessels is found in this locality, the source of the material being near one of the buttes south of the villages. This kaolin is only used to produce a finish on ware made from the coarser local clays. The body of the ware is a paste, made by mixing two of the local clays in about equal portions. The material is freed from stones and sand and placed in a bowl and soaked with water. When it has been softened and a portion of it is desired for use, it is removed to a smooth stone slab and carefully spread out. During this process some of the moisture of the clay is absorbed in the stone and some dried out by the air, and in a short time it approaches readiness for use. After a course of rolling and kneading, it is in proper condition. In case the clay has too much moisture, it is spread out on a stone slab which is later leaned up in a slanting position in the sun. It will be observed also that no temper is mixed with the paste. In forming the vessels the clay is taken between the two hands and molded evenly into a long cylindrical mass. This is wound spirally at the beginning; other similar rope-like masses are added until the work is completed. During the process these coils are pressed together and a vessel of comparatively smooth surface is a result.¹ In large vessels this process can only go on for a few inches at a time as the softness of the clay will not bear up under the weight of the structure. Generally several vessels are under process at the same time. Larger vessels are begun on a concave disk of pottery which admits of the work being turned about with facility. When the vessel is firm though still "green," the surface is gone over with a smooth stone carefully applied with a brushing, rubbing motion, removing all irregularities to bring it to a smooth polished surface. When the vessel is dry a wash of white clay is applied and this in turn is rubbed down with a polished stone. The vessel is now ready for decoration. Material has been prepared for paints by rubbing yellow ochre and dark brown ironstone on a stone slab. Yellow ochre is mixed with water as a medium and burns a bright red on the ware. The ironstone is usually ground with oil made from the seeds of the tansy mustard. This paint burns dark brown. The colors are applied with simple

¹ See Zuñi potters group.

splints of yucca leaf, which are handled with marvelous proficiency by the potter, who holds the vessel on her lap and works out the design with unerring accuracy. The outlines of the solid designs are made first and the surface to be covered is filled in with even strokes.

Slabs of stone on which the clay is worked or dried, stones with which the clay is sometimes crushed before soaking, paint slabs, smoothing stones and other odds and ends of stone lie about the places where the potter works. Some of these are of customary use and others are of temporary or emergency service. As a rule the best potter will have gathered together in her workshop the greatest stock of things that may be useful. The customary tools are spoon-shape formers of gourd for pressing down the coil ridges and for preliminary smoothing; polishing stones, glossy from long continued service; a rabbit fur mop-brush for applying the wash of white clay; and yucca leaf brushes for drawing the designs. Occasionally a small stick is used to punch holes for the insertion of handles or to form the mouths of small vessels. The bottom disk, which is the equivalent of the potter's wheel, is formed by plastering clay over the convex of a basket bowl, removing the shell of clay and baking it, thus nearly all of these specimens bear basket impressions which are in turn imparted to the bottom of vessels formed in them. The potter also makes use of blankets, baskets and sundry cups, canteens, vases and bowls of pottery in her work.

As the potter's vessels are finished, they are set aside in a safe place to await a calm and convenient day for burning them. The preparation for burning pottery entails much arduous work on the potter. She must gather slabs of sheep dung from the floors of the corrals on the benches below the mesa and carry them in her blanket to the place selected for the kiln. Here also she brings a blanket load of white sandstone and transports from the house on the mesa the pottery to be burned. She clears off a circular space of ground and builds in the center a small fire of dry dung and around this fire disposes the pottery so that it may be evenly heated and thoroughly dried. The pottery in this heat becomes lead color and when adjudged sufficiently hot and dry is compactly set up over the ashes of the fire, bits of sandstone being used to separate the pieces as stilts are employed by the civilized potter. Around the pile is built up a circular wall of the slabs of sheep dung closed over the top with large slabs. This structure, at once fuel and kiln, ignites from the remains of the previous fire and soon produces a high heat, the pottery assumes a bright red color, and when the kiln has burnt out the ware will be thoroughly baked. The kiln needs constant attention to prevent pieces of the fuel falling on the ware, which would produce blemishes. Also if a breeze should start up the potter must shield the kiln with a blanket. On account of superstition the pot-

ters maintain silence when the burning is in process lest the spirits be offended and cause the vessels to break. This is probably in part a fire taboo and in part due to a belief that a proper spirit inhabits each piece of pottery.

Pottery-making among the Hopi is at present confined East and Middle Mesas, having become obsolete at Oraibi. There is evidence that the art which in ancient times produced the superb ceramics of Sikyatki and the interesting and beautiful ware of the ruined pueblos of the Hopi clans had declined and become almost extinct in the late seventeenth or early in the eighteenth century. On the arrival of a group of Tewans from the Rio Grande, who were settled at Hano on the East Mesa, about 1700, the art was revived by these potters, but the style of decoration was necessarily foreign and remains so to this day. Pottery, especially vases, collected at Orabai by Major J. W. Powell in 1872, probably represent a transition or survival of the ancient Hopi art. These unique specimens which are exhibited in the United States National Museum¹ were in use by the Oraibi, but were evidently antique and were not still made at the time of collection. The designs show transition, and the forms, while following that of the ancient and graceful Hopi vases, are cruder. Some of the old Oraibi pottery imitates Zuni form and design. Ancient Hopi pottery is yellow, orange, and cream color and was never surface washed with other clay. While traditionally some of the Hopi clans occupied formerly the region where gray ware decorated with black was prevalent, this ware was never made by the Hopi since they occupied their present location. A few specimens of a particularly fine gray ware have been found in ancient Hopi ruins on the Little Colorado near Winslow, Arizona. The loss of the art of making gray and red ware by the Hopi presents an interesting field for study, which contains important data on the history of this people.²

WOOD.

The timber supply in proximity of the Hopi villages is not now and probably never was large or varied. The only tree of general use in the vicinity is the cottonwood, *Populus monilifera*, *pa she hurps be*, of the Hopi, a quick-growing tree along washes, near springs, or wherever there is water. The cottonwood forms the chief basis of the Hopi wood-working industry, and on account of its religious associations and economic uses may be termed the Hopi culture tree. The pinyon, *Pinus edulis*, which grows farther away, is somewhat useful for beams, etc.; but the great pines of the mountains are too distant to be available. The most prevalent tree, the juniper,

¹ West north hall, first floor.

² A splendid collection of the ancient Hopi pottery is exhibited on the second floor, east north hall of the Natural History Building.

Juniperus occidentalis, is valuable for firewood, but its brittleness and crookedness render it almost valueless for Hopi construction. For minor uses the oak, *Quercus gambelli*, is brought from long distances to the north for bows, digging sticks, clubs, weft battens, etc. (see pls. 30, 44), and the mountain mahogany *Cercocarpus*, also brought from the north, has its chief use for small weft batens and combs employed in belt weaving. Among the minor wood stuffs having economic value may be mentioned yucca flowering stalks and wands of the rhus and willow.¹

Timbering by the crude processes pursued by the ancient Hopi consisted of felling the larger trees and cutting them off to lengths by means of fire. Smaller growths were cut with the stone axe, limbs broken off with the stone hammer-maul, and saplings and stems sectioned with the saw-scraper.² The logs were peeled with the stone axe. So far as can be determined the wedge for splitting wood was not known. In the further operations of wood-working the stone rasp, the knife and saw of chert, and the drill and smoothing stones were used. Of the stone-age tools only the rasp and drill (fig. 42, *a*, *b*, *c*) have survived to the present, iron tools having been substituted. This change appears to have taken place recently in regard to most of the implements.

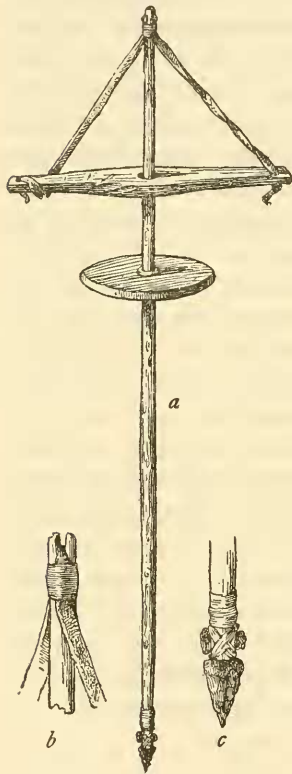


FIG. 42.—*a*. PUMP DRILL. *b*. DETAIL OF AFFIXING THE STRAP. *c*. DETAIL OF POINT.

The objects of wood, which are carved, consist of dolls (pl. 42), *tihus*; parts of masks, animal figurines as birds, feather boxes (pl. 43, figs. 2 to 5), etc.; and pahos of great variety. Joined work consists of masks, headdresses, slats of wood, altar frames, lightning sticks (see fig. 45) and other religious paraphernalia (figs. 43, 44). Joining is effected with leather thongs or fiber cord and wooden pegs and pin-yon gum. Among the various simple objects of wood made by the Hopi are firemaking sticks, digging sticks, rabbit clubs, bows and arrows, weaving tools, parching rods, traps, loom parts, etc., which are described under their appropriate classes. Wood was worked in the main like stone, and some wooden objects like dolls were ground

¹ For wood used in house construction see Mindeloff Pueblo Architecture, 8th Ann. Rept. Bur. Amer. Ethnol., 1886, p. 102.

² Hough, Bull. 87, U. S. Nat. Mus.

to shape on stone without the interposition of any tool. Short simple implements like weaving battens and digging sticks were ground in this way and with an abrading stone of convenient shape held in the hand all the mechanical requirements for sculpture in the round, the undercuts, ridges, chamfers, grooves, etc., were possessed by the Hopi woodworker. It is observed also that the quality of workmanship in wood shown in the ancient specimens¹ has not been advanced by the possession of iron tools in the modern epoch. It appears that iron tools have

only served to increase the facility of getting the raw material and the speed of manufacture of the products.



FIG. 43.—ORNAMENTS FOR SIDES OF MASK. a. FRONT VIEW. b. SIDE VIEW.

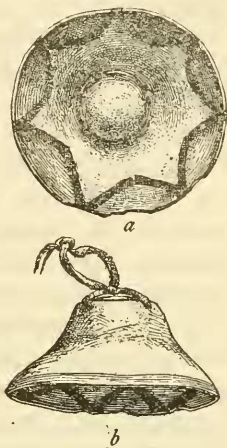


FIG. 44.—MASK ORNAMENTS OF PAINTED GOURD. a. FRONT VIEW. b. SIDE VIEW.

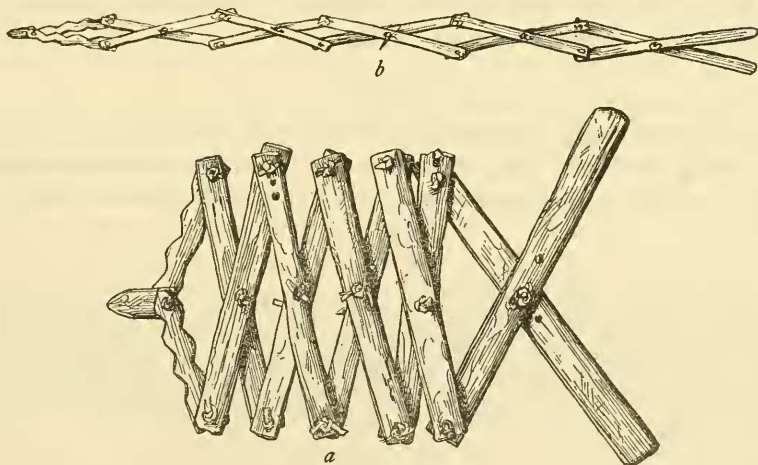


FIG. 45.—a. LIGHTNING FRAME CLOSED. b. SAME EXTENDED BY PULLING HANDLES TOGETHER.

The absence of the wedge which generally precedes the saw or any other primitive tool and useful in the procural of masses of wood

¹ Fewkes, Dr. J. Walter, 17th Ann. Rept. Bur. Amer. Ethnol., pt. 2, pls. 164-5; Hough, Bull. 87, U. S. Nat. Mus., 1914.

with plane surfaces was a great drawback to Pueblo woodworking. Such wood sections of small size and of very fissile wood as the flower stalk of yucca and like plants were indeed made in some localities, but in small amount and probably by splitting with the flint knife. Usually such pieces were ground down on sandstone from larger masses of wood.

Cottonwood trees often decay, forming hollow shells of thin wood which the Hopi appropriate for drums.

HORN.

The Hopi formerly made a limited use of horn in the arts, chiefly for large spoons used in preparing and serving food. For these utensils the material was the horns of the mountain sheep which already approximated the form desired. The horn was rudely dressed and bent to shape with heat, and the finished ladle is rough and clumsy, probably owing to the difficulty in working the substance by the abrading methods practiced by the Hopi. Identical horn ladles are found in all the Pueblo villages and their number indicates the abundance of mountain sheep formerly existing in the mountains of New Mexico and Arizona.

The disk whorl of the spindle was sometimes made of horn, and hooks for the pack strap and combs for weaving were occasionally of the same material. Horns of the antelope were used entire as hooks planted in the walls of houses; sewed to certain helmet masks or perforated to form a wrench for straightening basket wands, arrowshafts, or other rods (see pl. 46, fig. 4). Entire horns were also used as bells or rattles (see pl. 22, fig. 1).

BONE.

Bones of animals entered little into the arts of the Hopi, the chief use being for awls (see pl. 46) and leather-working implements. Scapulae were used in music (see pl. 51) and as scarecrows (see pl. 22, fig. 3).

SHELL.

Shell work is sparingly practiced by the Hopi, but when possessed of shells from the sea, which they value highly, they are able to perforate them for stringing as necklaces and rattles; but they do not make beads or do any work in shell comparable to that found in the ancient ruins.

LEATHER.

The environment of this portion of Arizona is not animal and there was always a scarcity of skins for clothing and other uses. In consequence weaving became much developed among the Hopi. Nevertheless, the trade in tanned deerskin was very important and

comprised the chief exchange with less advanced tribes living on the range of the deer. The most valued skins were procured from the Havasupai living in Cataract Canyon, about 100 miles west of the mesas. Less valued skins came from the Apache of the White Mountains, to the south. Formerly great herds of antelope roamed over the rolling grassed plains of the basin of the Little Colorado River. A disease of some unknown character is said to have diminished their herds in historic times, and on the introduction of great numbers of cattle, with the consequent depletion of the grasses, the antelope became practically extinct. This animal, though difficult of capture, no doubt furnished a certain amount of food, but its skin is thin and weak and of insufficient value to repay tanning.

Dyeing leather by infusions of bark, etc., was known to the Hopi; and they applied colored earths by rubbing them into the open texture of the surface of soft tanned skins. Colors were also applied mixed with some medium as saliva, or an emulsion of oily seeds, etc. The mordant for infusion or vat color was almsgen or crude native alum.¹

In dyeing leather black an advanced process like that known by the Navaho was employed in which an iron tannate (ink) is found. The knowledge of this process appears to be derived from the white man and probably came in with the weaving of wool like the secret of mordanting indigo, this dye being introduced to the Pueblos at an early date at the Spanish settlements on the Rio Grande (Santa Fe, Espanola), in order to encourage the industry on the Crown lands of Mexico. It appears, however, from archeological data, that mordanting was known to the ancient Pueblos, but not to the extent indicated by the black dyeing process mentioned, which resembles more the crude rule of thumb recipes developed with the European industries before the knowledge of chemistry became accessible. The lines of progress of the dyer's art have been followed to a greater or lesser extent by most uncivilized tribes; thus some of the processes now reduced to scientific exactness are observed in their crude tentative shape among people of low advancement. In some environments the conditions are rarely favorable for their utilization. They are put to use in areas where a civilization is developing under what may seem unfavorable surroundings and the needs of the population must lay under contribution for products lands situated at great distance; thus Peru drew on the Amazon Valley; Mexico on its tropical coasts; and the Pueblo region on its subsidiary environments. It can readily be seen that the Pueblos would have developed a much more complex and markedly higher material civilization if tropical or subtropical sources of supply had been accessible. The

¹ Hough, A collection of Hopi ceremonial pigments. *Ann. Rept. U. S. Nat. Mus.*, 1900, pp. 463-471; Pepper, *The Making of a Navaho Blanket*. "Everybody's," Jan., 1902, p. 37.

Hopi, thrown on their own resources, made a creditable showing in the application of color to materials beginning with the most primitive and advancing as follows: Staining with earth and mineral colors; dye infusions of flowers, seeds, bark, etc., simple or in combination, or combined with mineral colors; the discovery of fixing or saturating material with color by boiling in infusions; and the discovery, by chance perhaps, of a mordant through empirical experimentation. Tools used in tanning have not been seen among the collections from the Hopi, as these collections have all been gathered in recent years since the game became scarce. From prehistoric sites there have been recovered leatherworking tools, consisting of breakers of deer tibia and pelvic bones and fleshers of femurs. Such bones on account of their shape and availability were generally used by the American tribes. The cutting of leather by primitive methods presents some difficulty, and it would seem probable that among the American Indians before the introduction of iron elaborate leather work would be difficult and for costumes perhaps robes to a large extent served the purpose of formed garments. Rawhide and tanned skin can be cut with chips of chert, chalcedony, and obsidian, the latter being very good for the purpose, but none of these stones are as effective as iron. All leather cutting in prehistoric times was done with chips or flakes of stone and no classified implement for the purpose has been found. The chief tool in leatherworking is the bone awl, whose point makes possible fine sewing as that with the needle. Awls are found in profusion in the ancient sites, those for leather sewing being characterized by a fine slender point.

Another important use of tanned leather is for moccasins (see figs. 15, 16, 27). The method of making them is as follows:

The outline of the foot is traced on the piece of rawhide, the thick skin on the back of cattle being regarded as best. Outside of this outline a margin of about half an inch is traced and marked, and the sole cut out to this outline. The next step is to soak the sole, form it up at the edges, and around the edge is cut a slit for the welt. The welt is then bent up and the vamp which has been cut out is sewed on with sinew by means of the bone awl. When the sewing of the vamp is completed, the moccasin is turned inside out and the heel portion sewed on, care in every case being taken to hide the stitches, the resultant work being extremely neat. The heel leather is cut with a flap which goes over the ankle and is buttoned as in the Navaho moccasin, or tied with a buckskin thong. It will be seen that as the sole is larger than the foot, the surplus rolls up over the sides, giving an excellent protection for the foot against sharp rocks, thorns, etc. Often, according to taste, the vamp and heel portion are of different colored leather.

A variety of small pouches of buckskin are made, usually being simple pursings of leather, or with little sewing. The most complicated is in the shape of a crescent moon, the opening supplied with a flap, being at the center. Thongs for carrying the pouch are tied at the ends of the horns. This pouch resembles those of the Zuñi (fig. 46).

Another use for leather is in making ceremonial shields and masks, and for this purpose rawhide is used. Some of this work, especially in imitating the form of horns of the mountain sheep, is very skillfully done.

One of the important uses of leather at present is connected with the horse and burro for sinches, hobbles, pack saddles, bridles, whips, etc. Lariats braided from buckskin were formerly made, and the work on them is very neat.

WORK IN FEATHERS.

Feathers are of prime importance among the Hopi on account of their extensive use in ceremonial paraphernalia and objects nearly connected with religion. In this respect they are used on ceremonial costume, masks, prayer sticks, prayer offerings, and offerings of felicitation at the Soyaluna ceremony (see pl. 43, fig. 1), and many others. There is little if any secular use of feathers, but quills were used in a kind of textile work (see pl. 32), and as bird snares. Anciently feathers of the turkey were applied to cords with which blankets were made, and these blankets preceded the rabbit skin robe.

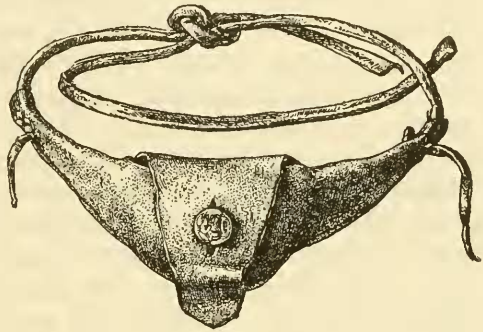


FIG. 46.—LEATHER WAIST POUCH WITH WAIST CORD.

MASK MAKING.

The skill of the Hopi is displayed in the making of masks, which with other complicated religious paraphernalia, demand a many-sided ability for construction.¹ Masks covering the head are formed of a width of dampened rawhide, sewed at the edges and pushed or formed into shape. Orifices are cut for the mouth and eyes. When dry the leather is firm and the mask is painted and decorated. Teeth are sometimes cut from a strip of leather and fastened on with sinew. The tongue, if required, is a strip of leather painted red and thrust through the mouth orifice. If a beard is required, it is made from horsehair or fur and sewed on. Lashes of hair are placed over the

¹ Examples may be studied in the west-north hall of the United States National Museum.

eyes and a mass of horsehair or fur sewed to the top of the mask. The nose is often a cylinder of wood sewed in place with sinew or pegged on, or it may be the neck of a gourd, and the ears are often blocks or tablets of wood or flaps of leather. Many masks are supplied with a visor consisting of a section of coiled basket. Some of the masks require snow on top, and this is simulated with cotton; feathers, grasses, etc., also decorate the masks. Around the lower margin of some of the helmet masks is tied a roll of painted cotton cloth or fur or pine twigs as seen also in Zuñi helmet masks.

Cap masks have for a foundation a bowl-like wicker or twilled basket structure, or in modern times the crown of an old felt hat. Horns of the antelope are pierced with holes at the base and sewed on or imitation horns of the mountain sheep ingeniously molded in rawhide are sewed to the masks to form the headdress of the Alawimpkia or priests of the Horn Fraternity. The necks of gourds are also used to represent horns. The horns and cap of these masks are frequently formed of one piece of skin, and to cut the pattern so that it will join properly requires considerable ingenuity.

Masks representing women resemble masks with which civilized man is familiar. The face is modelled with some art and when surfaced with pinkish clay and supplied with a wig have a striking similitude to Hopi women. Women's masks or those representing female beings are supplied with ears representing squash flowers formed by wrapping bright yarns over a radiating frame of splints or martynia spines (fig. 43 *a, b*). A coronet around the top of the mask is sometimes formed in this way. Flowers are often carved from disks of gourd (fig. 44 *a, b*) or consist of a wooden disk with wooden petals stuck around the periphery, or they may be of carved wood. Bangs on the woman's masks are made of horsehair dyed red. This is made in a strip, the ends of the hairs held tightly by a braiding of three cords. Sometimes the bang is made of white goat's hair. All the ancient female deities wore bangs.

The masks of joined wood are remarkable pieces of work. They are fan shape and consist of numerous bits of wood ground to shape and joined with wooden pegs to represent flowers, stars, rainclouds, birds, etc. They are erected on a semicircular frame of wood or rods covered with cloth which fits over the sides of the head. They are gaudily painted with bright earths and are very striking. In the apex is a ring of cornshuck which rests on top of the head when the mask is in place, and the mask is secured to the head by leather straps or buckskin thongs. Some of these masks are made up of rain-cloud tablets sewed together and have a rectangular opening for the head. Some of them consist of a framework of rods covered with painted cloth or skin. This construction is carried out in other religious

paraphernalia. The several types of masks used by the Hopi may be classified as follows:

1. Helmet masks of rawhide, which cover the whole head. Bag masks after the helmet type.

2. Face masks modeled in rawhide to represent the human countenance, animal, or monster heads.

3. Cap masks of basketry with curving horns modeled in skin or made of necks of gourd. Hat masks of one piece of skin forming the head part and two upright horns.

4. Coronet or tablet masks of joined pieces of wood or skin stretched over a framework. With these is worn a visor or band passing around the head and having eye, nose, and mouth holes cut in it. Such visors are also worn with the cap masks.

There is an immense amount of inventive ability, mechanical skill, and artistic labor displayed in the construction of ceremonial paraphernalia—the scenery of the religious rites, if it may be so called. The personal paraphernalia of costume masks and objects collected, with the participation of the celebrants, run the gamut of complexity in their preparation, but the requirements of the collective setting of the ceremonies are even more far-reaching. The difficulty of the mere record of the preparations and mechanical conduct of a single ceremony is enormous. The altars alone, erected by the different fraternities during the rites, are marvels of complexity. Some ceremonies demand mechanical manipulations that are surprising in their production and in their effect on the beholder. One of these is the Palulukong ceremony, excellently described by Doctor J. Walter Fewkes,¹ which huge mechanical snakes emerge from orifices in the altar frame or from great jars and struggle realistically together or with the celebrants.

An invention of the Hopi which shows ingenuity is a folding frame used in ceremonies to represent lightning (figs. 45 *a*, *b*).

WEAPONS AND HUNTING.

The social organization of the Hopi is very complex, being interpenetrated by the rules and laws of an extremely involved religion, itself a partial fusion of ideas of varied origin.

In its elementary form the organization is based on the clan and its group of laws, secular and religious. The case of a single clan occupying its own settlement is comparatively simple. Here the government would be administered by the circle of clan elders who act both in a religious and secular capacity, directing all the practical work of the clan, but on a religious basis—that is, all activities are to be referred to the direction of the supernatural powers, appeal to which would be through the fraternity. The approximation

¹ Fewkes, Dr. J. Walter and A. M. Stephen. The Pa lu lu konte: Journ. Amer. Folk-Lore, vol. 6, Oct. and Dec., 1903, pp. 269–284.

of several clans in one village requires adjustments, but these give rise to no serious changes in the organization. A coalescence of clans gives rise to no higher social functions, and it may be said that at the arrival of the Spaniards the executive or gubernatorial functions of the Hopi were not invested in a single head. This feature was forced on the Pueblos by act of the United States Government by the appointing of civil chiefs, whose power in effect was nothing unless it coincided with inherited clan delegation of authority.

The displacements of the social organization at times are very curious. Ordinarily when a ceremony is not in progress such regulation of the activities of the pueblo as are necessary is provided through the council apparently without action of a fraternity. During a ceremony the pueblo appears to be in the control of the fraternity or fraternities holding the ceremony. This is shown in the closing of the trails leading to the pueblo to prevent profanation, first observed by the Spaniards under Espejo in 1583. The patrols who even to this day order white men away during ceremonies seem to point to this feature. It would appear that clan control of the village was the usage at times of a ceremony held by members of a clan.

It is true, however, that all ceremonies by any clan whatsoever are held for the common good of the associated clans constituting the village.

War and hunting are also features of the social organization. War or protection was socio-religious and was entrusted to a fraternity. Hunting belonged to the communal type and was a feature entering into the rites of some fraternities.

HUNTING.

Hopi legendaries say that before the advent of the white man their country was covered with excellent grass and consequently there was much game. There appears to be a substantial foundation to this legend, since we know that by wasteful methods of overstocking, the grasses and other herbage of Arizona have been reduced by the white man to a minimum in some parts and exterminated in others. In former times, then, the range of animals may have been extensive where now they are restricted. The antelope was, as we know, plentiful in all portions of the open country, and probably deer of several species ranged with them. Bear also had a more extensive range on account of food, there being evidence that juniper forests were much more widespread than at present. Smaller mammals, like the fox, coyote, wolf, skunk, raccoon, porcupine, badger, prairie dog, rabbit, hare, mice, etc., may or may not have

been more prevalent. Birds are still numerous; reptiles and insects are yet in sufficient quantity.

The above is a summary of the animal resources, near and far, which were available to the Hopi and use was made of all of them.

The capture of the larger mammals was effected by battue, the game, principally antelope, being driven into corrals having pockets. This method was pursued anciently but was greatly accentuated on the acquisition of the horse and the iron axe. The Hopi, however, did not pursue this method to the same extent as the Navaho, preferring rather to depend upon the number engaging in the hunt and individual agility which rivaled that of the animals themselves. They also wore as decoys the heads of antelope prepared for the purpose, thus taking advantage of the well-known curiosity of this animal.

Hunting was, to a great degree, ritual, ceremonial hunts being an accompaniment of certain ceremonies, as the *Soyaluna*. Hunting undertaken as such by individuals was attended with ceremony and aided by fetiches, but chance flushing and pursuit of game had no religious character. The curved flat club-boomerang was the favorite weapon for killing small game, and in good hands was almost as accurate within its range as the bow and arrow, but the latter had necessarily a more extensive use. Skill in throwing rocks may be mentioned in connection with the capture of game. The capture of animals depended upon the habits of the animals themselves and upon circumstances. Thus, during heavy rains, rivulets were conducted into the burrows of prairie dogs by means of a hoe, and the animal coming out in half-drowned condition was dispatched with a stick, dozens being so captured in a short time. The habits of animals were well known to these Indians, and this knowledge was brought in play when the occasion arose.

Animals taken ceremonially for use in religious observances are required to be captured without mutilation and without shedding of blood. This taboo is based on the prescription of perfect offerings and has given rise to the use of the club-boomerang, regarded as a ceremonial hunting weapon for the capture of small mammals, instead of the bow and arrow.¹ Birds whose plumage alone is desired in its utmost perfection are therefore not killed with the club or the bow and arrow, but snared and trapped. Small birds are taken with a series of nooses secured at intervals along slender rods planted near springs where birds congregate. The nooses now used are of horse-hair. Seeds are scattered about the place and the birds feeding become snared in the nooses. Eagles are caught with far greater difficulty, the method being to build a circular tower on some high elevation, place over the top a frame of rods lashed together, and

¹ The Zuni prescription for the ceremonial taking of deer is that the animal shall be smothered. Mrs. M. C. Stevenson, 23d Ann. Rept. Amer. Bur. Ethnol., p. 439.

upon which is tied a rabbit. The hunter after ceremonial purification enters the tower and patiently waits for an eagle to swoop down upon the rabbit, and when this occurs the man reaches through the frame and seizes the eagle by the legs. In its struggles to escape the eagle becomes exhausted, rendering its subjugation easier, but the hunting needs, on the part of the Indian, great patience, courage and address.¹ Eagles so captured are impounded until the feathers are needed. The Zuñi keep them in cages.² Especially important in Hopi ceremonies is eagle down and the supply is gathered from young birds taken from the nests whose ownership is vested in the clans.³ These birds are brought to the pueblo, stripped of down and killed by pressure on the sternum and buried in the eagle cemetery. The wild turkey was formerly kept for its feathers⁴ and at present the domestic turkey is used in its stead. The great demands for feathers of various birds in the ceremonies necessitates efforts to maintain the supply, and extraordinary skill in capturing them.

Communal hunts, so-called, should be considered from the social and religious side of Hopi life rather than from the economic standpoint. The origin of the custom may have been utilitarian, necessitated by the habits of game in an open country, the primitive gregarious method of Hopi hunting by driving, running down, and surrounding the quarry, the protection of numbers in the presence of enemies, and finally the carefree enjoyment of such hunts in company with congenial spirits intent on getting the most out of the occasion. In fact to an observer of a hunting party in action, the peaceful people seem to be anything but that, and to have let themselves loose with the intention of massacring everything living in sight. The hunt may be divided into two periods—the departure to the field with hilarity, the fierce hunt, though only for rabbits, and the subdued return with whatever the gods of the chase have awarded in the way of game.

The Hopi trap the coyote, the fox, and other mammals and birds. The common form is the deadfall, the weight consisting of a flat stone held up on a peg with rounded ends, the lower resting on a convex surface of wood, giving a very unstable support. The bait is tied to the peg and a slight pull upsets the support and releases the stone. A similar trap is found among the Zuñi. The simplicity of this device is noteworthy; it can be prepared in a short time from material readily at hand and without tools, the rubbing necessary to round the sticks being done on stones. The figure four device is not known to the Hopi and indeed on account of the meager environment

¹ Property rights in eagles among the Hopi, J. Walter Fewkes, *Amer. Anthropol.* (n. s.), vol. 2, Oct.—Dec., 1900, p. 70.

² Zuni Folk Tales, F. H. Cushing, New York, p. 34.

³ Fewkes, *Amer. Anthropol.* (n. s.), vol. 2, 1900, p. 69.

⁴ Winship, in 14th Ann. Rept. Bur. Amer. Ethnol., p. 517.

the rather complicated inventions which characterize the traps of the tribes who depend largely upon the chase are not developed here. The name for trap is *cha-kom-i*, appearing in continuation as *ish-chakomi*, coyote trap; *peha-chakomi*, bird trap.

WEAPONS.

One of the most curious of American Indian weapons is the throwing club, "boomerang," called *pute kohu* (pl. 44, fig. 4, Cat. No. 126348 U.S.N.M.). It is made of oak, *Quercus gambelli*, a very hard tough wood, presenting great obstacles to working, especially with the crude tools and appliances of the Hopi. The club is flat, about one-half inch thick, and the curve is produced by working from wood selected for its natural bend. At one end a hand-grip is cut and the other end is usually apexed. The club is smoothly finished, often polished, and is painted red with a customary—perhaps prescribed—design in black, representing rabbit feet. The careful finish of the club appears to be for the purpose of expediting its passage through the air. It is held in position for throwing with the concave edge front brought down with a sweep and released in a horizontal position (pl. 53). It rotates in the air and on striking the ground or an obstacle executes a series of evolutions, often for several yards around the point of contact, touching the ground and erratically flying up several times, but has no tendency to return to the thrower. The Hopi use this club with considerable skill in hunting rabbits and rarely miss the quarry. The weapon appears to be very ancient and may at present be assigned almost exclusively to the Hopi. Clubs that suggest the beginnings of the flat *pute kohu* are frequent (pl. 44, fig. 1, Cat. No. 69480, U.S.N.M.) and are the common form of the Zuñi. This club is often flattened on the sides (pl. 44, fig. 2, Cat. No. 69534, U.S.N.M.) and when more flattened and formed at one end for grasping (pl. 44, fig. 3, Cat. No. 69443), the resemblance to the typical *pute kohu* (pl. 44, fig. 4) is apparent.

The bow and arrow must be regarded as having been the most important weapon of the Hopi, but as the innate character of the people is peaceful, their name expressing this aspect, the extent and development of weapons among them is very limited. The bows, so far as may be determined from specimens collected within forty years and which no doubt represent modified survivals, are small. They are made of a hard and elastic oak, *Quercus gambelli*, procured in the mountains far to the north of the villages, and though short are strong and effective. They are self bows and there is no evidence that they were backed with sinew, as was the custom with their neighbors and enemies, the Ute, Navaho, Apache, and other tribes. As mentioned, the formation of a bow from tough oak by means of the

crude stone-age tools, was difficult; the procural of the wood itself required exceptional labor, especially as the wedge was not known. As among most American tribes, fire and the stone ax were the chief agencies used in timbering. The bow was worked out from the rough wood and finished by attrition on sandstone and with gritty rubbing stones (pl. 45, fig. 1, Cat. No. 69532, U.S.N.M.). The curve in the back of the bow is formed by heating and bending the wood. The nocks are not deep. The string is of sinew looped at one end and wound and half hitched to the bow at the other end. Most of the bows are painted, which indicates their connection with religious observances. This has been the case with ceremonial offerings of bows, etc., from ancient times. Arrows are made from sprouts of Rhus, oak shoots or wild currant smoothly finished (pl. 45, figs. 2, 3, Cat. Nos. 69,603; 84,318 U.S.N.M.), the triple feathering of hawk's plumage wrapped on with sinew. The shaft is grooved, as was the general custom in America.



FIG. 47.—STONE ARROW USED AS A CHARM AGAINST LIGHTNING

Reed shaft arrows have not been used by the Hopi since their settlement in their present location; but the reed, *Phragmites communis*, has almost disappeared from the southwestern United States, and its extinction was gradual up to the time of settlement and grazing, when it passed away very rapidly. No Pueblo stone pointed arrows exist, iron having superseded them, and the stone points are frequently used as charms (fig. 47). The bark was scraped off, the rod ground and polished with sandstone abraders (shown in archeological collection), straightened with a horn wrench (pl. 46, fig. 4), feathered, the point set in, and the shaft painted with yucca splint brush (pl. 46, fig. 1) from a paint pot of four colors (pl. 46, fig. 5). The awl and primitive basket for holding resin are also property of the arrow maker.

To protect the wrist from the recoil of the bowstring, a leather wristlet is used (pl. 45, figs. 4, 5, Cat. No. 75700, U.S.N.M.). The examples in the United States National Museum are made from harness leather procured from the white man and have attached to them plates of tin ornamented with pierced work or punching.

It appears probable that lances were never used by the Hopi, or if so, only to a slight extent. They have been observed among some of the Pueblo tribes, who, it is thought, adopted this weapon from the Spaniards. The lances referred to have iron heads, often bearing the name of the maker and date. The iron-head lance of the Comanche, Kiowa, and other plains tribes may have had as a prototype a shaft tipped with a chipped stone head, like those which are

known to have been used in Mexico and which have come down to recent times among the northwest coast tribes and Eskimos.

While objects which appear to be shields of the flimsiest character are made use of by the Hopi in ceremonies, no effective shield has ever been found among them. A large basketry shield is noted from the ancient ruins of the Canyon de Chelly.¹ This forms the only evidence that the shield was used by the ancient Pueblos. The eastern Pueblos used shields, and it is worthy of consideration whether they were introduced from the plains.

There is no trace of the throw stick among the Hopi, nor has it survived in any of the southwestern tribes, though formerly its use was widespread. There is evidence that the throw stick had been invested with a ceremonial character even in ancient times among the Pueblos, a feature which often marks the decline and disuse of an implement. It is improbable that the stone axe or stone head club ever had important or general use as warlike implements of the Hopi, which seems to be borne out by the scarcity of such stone age relics in the ancient ruins. Nevertheless, a weapon or implement, called *pu u kong*, traditionally having a stone head, has given its name to one of the Hopi ceremonies. It may be possible that the stone head club mentioned was the peculiar weapon of one of the clans aggregated to the Hopi in former times and retained as a ceremonial element in the rites observed by the clan. The characteristic weapons of the Hopi appear to have been the bow and arrow and the wooden club. There is a tradition that a stick curved at one end like a shepherd's crook was anciently used as a weapon, but in a manner not explained. These crooks are associated with warriors in ceremonies and it is surmised that they may have been used for hurling darts somewhat as the throw stick. Frank Hamilton Cushing suggested the evolution of the bow from a stick of this kind having a cord stretched from the end of the crook to the straight part of the shaft, a dart being projected in a manner intermediate between the method by the bow and throw stock. The sling, which, with the throw stick, seems to be connected with the development of the bow, was never an aboriginal weapon of the Hopi.

The warrior according to Hopi ideas is represented in plate 52. The older weapons have become playthings for children, for whom are made bows, arrows, targets, clubs, etc. These weapons have also survived as ceremonial objects and one of the chief contributions of religion to the history of culture is the preservation of obsolete forms.

GAMES AND MUSIC.

Athletic games are limited among the Hopi, the game of shinney or bandy being almost the only open-air sport. The shinney is a

¹ 24th Ann. Rept. Bur. Amer. Ethnol., pl. 1.

stout curved club of Gambell's oak, brought from the mountains to the north, the ball being of buckskin stuffed with wool (pl. 47, figs. 1, 2). Foot races, hunts, and *mêlées* in the basket dance are ceremonial. Games of pursuit and capture follow the snake dance and are not considered sports, but general expressions of good feeling.

Children's games and toys consist of buzzers (pl. 47, fig. 4), tops which are actuated by a whip (pl. 47, fig. 6); handball (pl. 47, fig. 7); and pea shooters of gourd and yucca stalk, the spring being a strip of elastic wood (pl. 47, figs. 5 and 8).

The Hopi have a variety of the guessing game, widely disseminated among the Indians. For this game they use four cylinders of wood excavated at one end into a cup-shape cavity and decorated with painting, burnt work, carving and feathers (pl. 48, figs. 1-4 and 5-8, two sets. Cat. No. 128763 and 22330, U.S.N.M., collected by Mrs. M. C. Stevenson and Major J. W. Powell, respectively). The game is played by hiding a small object beneath one of the cups, having the opponents guess where it is concealed. A bundle of scoring straws keep the record.

The cups figured on plate 48 are excellent specimens of work in wood, and of decoration, especially by pyroligny.

The kicking game of the Zuñi and other southwestern tribes does not occur among the Hopi. Mention has been made of the custom of shooting with bow and arrow and of throwing stones at a mark. Feather darts of corncob are thrown at a rotating ring of corn husk (pl. 47, fig. 3). This game, which is called "Motoun," throwing the wheel, is ancient in the Pueblo region. It is played by boys. Women in the Owaculti ceremony throw arrows at a similar wheel.¹

Hopi children, having few toys, are compelled by the exercise of imagination to make the simplest objects serve in their child drama-play. It is interesting to observe the seriousness with which the little children conduct their play and the great psychologic reactions stimulated by a few corn husks, bits of stone, etc., gathered and spread out in some quiet place serving as the imaginary theatre. The Hopi are very fond of their children and do as much as they are able to contribute to their amusement. The practical side of most amusements is generally uppermost and play and education for future duties are cunningly combined. Objects in miniature are made for children. The potter constructs toy vessels, rattles, and dolls (pl. 49, figs. 1, 2, and 3), and sometimes manufactures models of houses (pl. 49, fig. 5). Toy cradles (pl. 49, fig. 4) are the most common and the most prized possession of the little girls. A little boy is given a bow and target. It is difficult if not impossible to differentiate the religious and secular ideas and usages in respect even to

¹ See Culin in 24th Ann. Rept. Bur. Amer. Ethnol., pp. 495-497.

children's toys. From the standpoint of adults, children's toys are given a religious significance through connection with ceremonials, but without doubt the children employ the toys secularly according to their limited knowledge. Dolls, therefore, are not the impersonal figurines of civilization, but are representations of spiritual beings. There are no dolls which can be named Flora or Mopsey; the name is that of some awe-inspiring ancestral or nature spirit. In fact the Hopi infants have no dolls as the name is understood in civilization. The figurines called dolls are *tihus* (see pl. 42), a word like the Nahuatl *teo*, translated god, and are prepared by celebrants in Katchina ceremonies to represent the being to be impersonated by the actor. After the ceremony the *tihu* is given to a child, who thus may become acquainted with the characteristics of the being and who probably is supposed to secure also some guardianship or other benefit from its possession. The *tihus* are respected and treasured by the children, who are not expected to fondle them as dolls, but such is sometimes the case.

MUSIC.

The meaning of the rattle is complex. It is principally a device for marking rhythm and is so used in the cycle of songs in the Flute and other ceremonies as well as in the meetings for instruction in singing. The rattle is also sounded at intervals in ceremonies as though marking an event in the performance. The sound is thought to have a magic influence and really has a hypnotic and inspirational influence.

Several kinds of rattles are possessed by the Hopi, this class of musical instruments showing great variation. Simplest are the fringes of seeds, hoofs, shells, etc., attached to ceremonial garments and sounded by movements of the body. The rattle of cedar berries is called *le pos te qua bi*. Not much in advance of this are the rattles of mountain sheep horn (*al te qua bi*). These consist of three horns pierced at the apex, provided with a thong, tied together and to a cord a cotton loop for suspension as with the horn bells mentioned below used by the rain priests in their morning runs to bring rain (see pl. 22, fig. 1).

Hoofs of cattle also pierced at the point, knotted on a thong and bunched, are frequently used in the same manner as the horns.

Bells of mountain sheep horn with clapper of the same material are sometimes bunched with other horns and hoofs and carried on their rounds by rain makers. The Zuñi occasionally make globular pottery bells, apparently a frank copy of a sleighbell, and in the ancient ruins in the Jettyto Valley, once inhabited by Hopi clans, small pottery bells of this form are somewhat frequently found. Occasionally they are of metal in the ruins south of the Colorado

Chiquito and have been evidently derived from Mexico. The bell must then be included in the list of Hopi musical instruments. Of the same nature as the bell are trinkets of shells of *olivella* and *conus*, worked or unworked, prevalent in ancient sites, and of hoofs, seeds, etc., occurring on existing religious costumes and paraphernalia. A curious scarecrow, consisting of a ring of twigs wound with cotton cloth, to which are tied, with wool cord, shoulder blades of a sheep and a tin can, is one of the oldest specimens from this region in the United States National Museum. (Cat. No. 9571, collected in 1870 by Dr. Edward Palmer.) (See pl. 22, fig. 3.)

Rattles of peculiar sacredness, made from the shells of the water tortoise, are called *yung uh sho na* (pl. 51, fig. 5). These animals are collected in the Colorado Chiquito, eviscerated without injury to the shell and the latter brought to the villages for use in the ceremonies. In making the rattle, antelope hoofs are fastened to thongs and sewed to a strip of buckskin provided with a loop to tie through the arch of the shell. A thong is passed through the other arch of the shell for fastening the rattle to the left leg of the dancer just below the knee. The movements of the dancer strike the pendant hoofs against the dome of the shell, producing a sharp sound. Some of these rattles in the National Museum collection are much worn from continual use. The Sia and perhaps other Rio Grande Pueblos bore holes through the shell for the thongs which secure it to the leg. The rattles of hoof fringing the snake kilt are called *shi la la*, and when of conical metal tinklers like those used by many Indian tribes, are called *shi va mash e*. The natural rattle of the dry seed pods of an *astragalus* used to amuse children are also called *shi la la*.

Rattles of which the sounding portion is the shell of a gourd are very common (pl. 50, figs. 1, 3, 4, 5). They are oblate, pear-shape and conical. The handle is of wood, either tapering regularly or with a shoulder formed on it, inserted in openings cut in the shell of the gourd, the latter resting on the shoulder and held by a peg passing through the projecting end of the handle. In the oblate specimens the handle passes through the gourd horizontally and in the pear and other forms vertically. The handle is short in most cases, but sometimes the gourd is placed at the end of a long staff of yucca flower stalk used in one of their ceremonies. A buckskin or cotton cord is passed through the base of the handle for suspension. Gourd rattles are always painted in bright colors and appropriate symbolism, the tendency being toward movement symbols. They are repainted and refeathered at the recurrence of the ceremony for which they are used, but sometimes a worn specimen is employed in soothing a child to sleep or for marking time in the singing classes. Rattles of skin are only used by the Snake, Antelope, and Soyal fraternities. They consist of a hoop of wood forming a frame over

which dampened skin is stretched. The short handle is enveloped by the surplus leather and fastened with thong. This rattle is always painted white. Its sound is likened to the warning of the rattlesnake.

Pottery rattles, following the form of the gourd rattles or as small toys for children, are sometimes made, but have no use in religion (pl. 50, fig. 2).

Clean, white quartz pebbles, in some cases small crystals picked up from ant's nests, are put in the rattles; and frequently, as is the Zuñi custom, sacred white meal is added. The Pima use wheat or white quartz pebbles as a rattling material, and the Yaki the seeds of the Washington palm. The Zuñi use white quartz pebbles and sometimes pink glass beads, and the Rio Grande Pueblos, in examples examined, pebbles of various colors, red predominating.

All rattles when prepared for ceremonies have attached to them downy feathers of the eagle on sacred cotton cord. This appears to be a form of consecration, the "breath feather," as it is called, giving communication with the spiritual world (pl. 50, fig. 4).

Some of the ceremonies have special rattles belonging peculiarly to them, as the *pa a ya* of the Flute ceremony, which consists of a crook bearing at the end a bunch of shells; and with the crook are tied a grass stalk and a rod set with disks of gourd, the bundle forming an object used only in the Flute ceremony.

Another form of rattle, *truh kun pi*, is one in which the sound is produced by rasping a rod of wood or a sheep's scapula over a row of notches cut in a stick (pl. 51, figs. 1-4). The notched stick is laid over the open mouth of a jar or gourd to increase the resonance. This rattle is entirely ceremonial, and is played by the men who represent the female Kachinas in the dances, hence it was called by observers "hermaphrodite stick" among the Pueblos and southwestern tribes. There is only one doubtful example going to indicate its antiquity in the Pueblo region, a notched bone discovered in a ruin near the Petrified Forests of Arizona. In Mexico, however, numerous notched human femurs used as rattles have been recovered.

The Pueblo notched rattle shows careful work in wood, and often bears carving and decorative painting. The Hopi specimens usually terminate in a terrace cloud carving. The Rio Grande notched rattle is generally sounded with a rod of wood, while the Hopi and the Zuñi use a sheep's scapula.¹

The Hopi collection in the United States National Museum contains several specimens, consisting of a disk of pottery or stone pierced with two holes through which pass cords, the disk being rotated by the alternate twisting and untwisting of the cords, the motion of the

¹ Archeological Fieldwork in Arizona, Ann. Rept. U. S. Nat. Mus., 1901, pl. 56.

disk producing a buzzing sound. The instrument is familiar as a toy of civilized children, and the Hopi probably have received it from the white man, especially since it has not become a part of the religious paraphernalia (see pl. 47, fig. 4).

One of the simplest yet most remarkable and very widely diffused instruments of music is the bullroarer, the rhombus of the ancient Greeks, consisting of a tablet of wood whirled through the air by a free-arm movement at the end of a string, producing an awesome groaning sound (pl. 51, fig. 6). The Hopi bullroarer is used exclusively in religious ceremonies, following in this respect its employment by almost all peoples, now or formerly. In civilization the instrument sometimes continues its usefulness as a child's toy. There is evidence of its antiquity in the Pueblo region.¹ The Hopi bullroarer is a rather thick tablet, pointed or terraced, usually at one end, supplied with a cotton string sometimes tied to a short handle. It is painted with white, red, black, or other pigment and decorated with the lightning symbol. In the Snake Dance it is intrusted to the war priest, who whirls it vigorously for a short interval at the commencement of the open-air ceremony of both the Snake and Antelope Fraternities. It is used also in the Soyal and other ceremonies. In all cases it is kept a mystery. The Hopi associate the sound with meteoric phenomena, and its use may be in effect an incantation to bring rainstorms.

The Hopi drum has a shell of cottonwood taken from a decayed tree trunk, and in most cases little modified by artifice, the shell thus showing irregularities of the surface and diameter of the tree. The heads are circular pieces of goatskin from which the hair has been removed; the skin is cut larger than the diameter of the shell, dampened, lashed on by a continuous thong, passed through holes cut alternately in the edge of the skin and fastened off. Sometimes a thong turned over each member of the lacing is passed around the middle of the drum. A thong for suspending the drum is tied in the lacing. The stick is short and has a padded beater of cloth tied on with string, and the drum is struck in the center of the head. One of the heads is often decorated with four animal figures. The Hopi drums in the United States National Museum are from 8 to 15 inches high, and from 12 to 18 inches in diameter. The native name is *pur shuk pi po ya*. A thin two-head, properly a tambourine, is also used. It has a shell of cottonwood 3 inches high and 16 inches in diameter. The heads of goatskin, lashed on as in the large drum, are decorated with a symbolic design representing a sun shield. There is no evidence of the antiquity of the wooden shell drum among

¹ Hough, Bull. 87, U. S. Nat. Mus., 1914, pl. 26.

the Hopi or other Pueblos, no specimens having been found in the cliff shelters or in locations where perishable material would be preserved. It appears probable, however, that the principle of the production of sound by vibrating membranes was known anciently to the Pueblos, and the pottery single-head drums of the Zuñi and Rio Grande tribes may be the surviving form. The pottery drum is not found at present among the Hopi. The Hopi wooden drum is very crude compared with those of the eastern Pueblos, and seems older, but neither the drum or tambourine appear among the musical instruments used in the unmasked or more archaic ceremonies, and for this reason seem to have been introduced by clans from the Rio Grande. (See cases in exhibit of Ethnology.)

The most important wind instrument possessed by the Hopi is the flute, an object regarded with peculiar veneration by the American Indians, as it is also by the Chinese (pl. 51, fig. 7). Two cognate Hopi religious organizations, the Blue Flute and Drab Flute fraternities¹ base their ceremonies upon this instrument, and the clans to which the ceremonies are assigned also derive their name from it. The flute belongs to the direct class, being held vertically and blown across the end; has five holes, and is made of a tube of the ancient prescribed material, but now often of cane procured from a distance.

The Hopi wish to incorporate light with the charm liquid or medicine, and in ceremonial purification. This is done by a reflection of sunlight from the facet of a quartz crystal. Smoke incense is added by blowing the vapor into the medicine and music by sounding a flute or whistle in the liquid. The same observance is presumably indicated when during the Flute ceremony, flutes are blown in the springs. The Flute clans are said to have come from the south, and in the ceremonial caves of the upper Gila objects made to represent flutes have been found, which were perhaps offerings from these clans. Small transverse flutes of reed are also found.²

The ancient and modern tribes used whistles of bone of the wing of the eagle, like those used by most Indian tribes. The bone has an opening in one side and a mass of pitch or resin is put in the bone to force the wind over a sharp edge in the bone, vibrating the column of air to form the sound. These whistles are called *tur turk pi*, and



FIG. 48.—WHISTLE OF TWO POTTERY DISKS INCLOSING A LEAF.

¹ Fewkes, 19 Ann. Rept. Bur. Amer. Ethnol., pt. 2, 1900, p. 957.

² Hough, in Bull. 87, U. S. Nat. Mus., p. 126, fig. 328, 1901; Ann. Rept. U. S. Nat. Mus., p. 322, pl. 56, fig. 2.

are used like the flute in ceremonial consecration of medicine as well as to imitate bird calls. A whistle made by enclosing a leaf or grass blade between two pottery disks is sometimes used (fig. 48).

The Hopi use a flute consisting of a gourd having a sound hole. This interesting object is a decoy for deer. (Cat. No. 22865, U.S.N.M.) Gourd trumpets or megaphones supposed to represent the hoarse bellows of the great plumed serpent, are used in the *Pa lu lu kong* ceremony.

As will be seen from the descriptions above, the Hopi have merely a few primitive instruments, the flute being the highest in the scale of invention. No string instrument occurs among the Hopi.